# THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXII.—No. 12. Whole No. 1,293. | NEW YORK, MONDAY, MARCH 19, 1900. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.



LIBRARY OF CONGRESS MAR 19 1900 SMITHSONIAN DEPOSIT



**Published** on each Monday of the year, at No. 32 Pine Street, New York.

**Collections** are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

**Terms of Subscription, Including Postage.**—For the United States and Canada, $3 per annum. European countries, $5 (£1—25 francs). All payments to be made in advance. Single copies, 10 cents.

**Correspondence.**—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

**Remittances** should be made either by post office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

**The American News Company,** Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

**Books.**—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C. O. D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

*The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.*


## CONTENTS.

An Asterisk (*) denotes an illustrated article.


OFFICIAL NOTICES—

Sixteenth Annual Meeting, Ohio Gas Light Association..... 441

Wrinkle Department, Western Gas Association..... 441

EDITORIALS—

Briefly Told..... 442

Death of Mr Joseph Walker—A Well Put Together Paragraph that Speaks for the Rate Situation—Notes.

Proceedings, Thirtieth Annual Meeting of the New England Association of Gas Engineers—Official Report—Revised by the Secretary—Continued from Page 411..... 442

Second Day, Morning Session—Report from Committee on President's Address—Appointment of Committee on Electrolysis—*Underwater Gas Main Construction—Completing the Discussion on Oven and Retort House Construction and Results—Another Dip into the Question Box.

Susceptibility of Trees to Lightning..... 448

Seventh Annual Meeting, Michigan Gas Association—Synopsis of Proceedings—Continued from page 413..... 449

First Day, Afternoon Session—Committee on Naming Next Place of Meeting—Ammonia: Its Saving and Concentration, by Mr. George Osius—Meter Testing, by Mr. Paul Doty.

The Equity and Expediency of Distributing Different Qualities of Gas Throughout the Twenty-four Hours, by Mr. E. H. Yorke.... 452

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 452

Annual Meeting, Paterson and Passaic (N. J.) Company—Consolidation, Chico, Cal.—Capital Stock Increased, Consolidated (N. Y.) Company—Amalgamation at Marysville, Cal.—A Hint from Perth Amboy, N. J.—Something from Westfield, Mass—Stock Increase, Laclede Company, St. Louis—Something from Newburg, N. Y.—Annual Meeting, Wilmington, Del.—Contract for the Western Gas Construction Company—Ogden Company, of Chicago, Adds to Its Capital—Progress in the Business of the Providence (R. I.) Company—Cheaper Gas for the Essex and Hudson Districts of New Jersey—And Other Items.

The Jasper Mantle..... 453

The Market for Gas Securities..... 454


[OFFICIAL NOTICE.]

## Sixteenth Annual Meeting, Ohio Gas Light Association.

OFFICE OF THE SECRETARY,
DELAWARE, OHIO, Feb. 15, 1900.

The sixteenth annual meeting of the Ohio Gas Light Association will be held at Columbus, Ohio, March 21st and 22d, 1900.

The President, Mr. A. P. Lathrop, of St. Paul, Minn., will call the meeting to order, on Wednesday, March 21st, at 9:30 A.M., in convention hall at the Chittenden Hotel, the headquarters. An address of welcome will be delivered by the Hon. George K. Nash, Governor of Ohio. A response will be made by ex-Governor Asa S. Bushnell, President Springfield Gas Company.

The following papers will be presented:

"By Product Coke Ovens as a Source of Gas Supply," by Mr. Peter Young, Gas Engineer, Detroit, Mich.

"Street Lighting," by General Andrew Hickenlooper, President Cincinnati (Ohio) Gas Light and Coke Company.

"Prepayment Meters," by Mr. John D. McIlhenny, President Citizens Gas Company, Terre Haute, Ind.

"The Present Status of Fuel Gas," by Mr. John R. Lynn, Supt. Portsmouth (Ohio) Gas Company.

"Gas Appliance Exchanges," by Mr. Fred. R. Persons, with Maryland Meter and Mfg. Co., Toledo, Ohio.

"Some New Ideas about Oxide Purification," by Mr. B. E. Chollar, Engineer Laclede Gas Company, St. Louis, Mo.

The Question Box, which is always an interesting feature, will be given special consideration. Each member is requested to make contributions for it, and send them to the Secretary not later than March 7th, so that they may be printed.

The gas works, the electric light plant, with a new 685-horse power gas engine, the pipe works and other places of interest will be open to the inspection of the members.

The ladies will be cordially welcomed and cared for.

An opportunity will be given any of the speakers at the meeting to correct their remarks before leaving Columbus, but not after, as all the reports will be turned over to the printers immediately after the adjournment of the meeting.

The Chittenden is conducted on the American plan, and the following rates have been secured for the meeting: $2.50, $3 and $3.50 per day for rooms without bath; $3.50 and $4 per day for rooms with bath. The Chittenden hopes to entertain all of the Association, and will put forth every effort to make the members comfortable. The most satisfactory quarters are always obtained by writing in advance to the hotel people.

The Secretary will furnish with pleasure application blanks for membership, and any further information which may be desired relative to the meeting.

T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

## Wrinkle Department, Western Gas Association.

WRINKLE DEPARTMENT WESTERN GAS ASSOCIATION,
OFFICE OF THE EDITOR,
112 NORTH BROAD ST., PHILA., PA., Feb. 16, 1900.

To the Members of the Western Gas Association: The Western Gas Association elected me last year Editor of its Wrinkle Department. The duty of the Editor is the securing (for presentation in convenient form to the Association, at its annual meeting), all possible wrinkles, ideas, devices, suggestions, etc., that during the year have been found by the members to be clever and helpful, in either the construction or operation of a gas works or company.

The success of the Wrinkle Department has been marked. It is looked forward to yearly with interest. *Its success, however, is de-*

*pendent on the co operation of the members.* Will you not kindly help the success of this feature at this year's meeting by sending me shortly a brief description of any thing or idea that you may have recently noticed, or that occurs to you as suitable for a "wrinkle?" Whether this be something noted by either yourself or your assistants or helpers, in your own works or in those of another, is not material. It is the point itself that is desired, and that each member is asked to kindly contribute, whenever possible.

Drawings necessary to illustrate an idea need not be exact or carefully made, a simple rough sketch will be sufficient, and will be redrawn here if desirable. Your active co-operation in the above will be appreciated by the Association at large, and by the Wrinkle Editor in particular.

Very truly yours,
F. H. Shelton, Editor.

## BRIEFLY TOLD.

Death of Mr. Joseph Walker.—We have to report the death of Mr. Joseph Walker, who passed away at his home, Port Huron, Mich., the morning of the 3d inst. Deceased, who was in his 59th year, had acted as Superintendent and Manager of the old Port Huron Gas Light Company for something like 25 years, retiring from its service when the local gas conflict, which eventually resulted in the merging of the interests of the Port Huron Gas Light Company and the Port Huron Fuel Gas and Light Company, was declared at an end. Following the consolidation, he engaged in the plumbing trade in Port Huron, but ill-health caused him, something over a year ago, to retire from active business. He was a member of the Michigan Gas Association, and those who attended its fifth annual meeting, held in Port Huron, Feb., 1898, cannot fail to remember the courtesies extended to the Association on that occasion by Mr. Joseph Walker and the Port Huron Club. The funeral was held the afternoon of the 6th inst.

A Well Put Together Paragraph that Speaks for the Rate Situation.—In our current chapters concerning the records of the last meeting of the New England Association of Gas Engineers is given the report of the committee appointed to consider and report upon the President's Address. The gentlemen who composed the committee have been actively in the gas business for many years, and they are actively and responsibly engaged in it now. Each of them has been and is an advocate of selling gas cheaply, and their respective communities have been served by them in practice according to their precepts. But the time seems to be at hand when the limit of concession has been reached. Willing to go on reducing selling rates they and their associates are confronted with the necessity of saving themselves. Within the last twelvemonth everything that enters into the manufacture and distribution of gas has increased enormously in cost; and within the same twelvemonth, aided by the recent queerly performed acts of the Board of Gas and Electric Light Commissioners, taking Massachusetts as an example, about two in three of the communities in that State have petitioned for "orders," ordering reductions in the selling rates for gas. The limit seems to be reached in the gas crusade, and the committee is to be thanked for its excellent exposition of the situation, as may be read in the lines of the report as it appears in the next column.

Notes.—"T. P. S." writes that Mr. D. E. Thompson is inclined to view with favor a proposition made by eastern capitalists for the purchase of a controlling, or the entire, interest in the Lincoln (Neb.) Gas Company. As Mr. Thompson has control in the Company it would seem that he holds the key to the situation; but he avers stoutly that the purchasers must give to the smallest shareholding an opportunity equal to that enjoyed by the largest.——The properties of the Gas Light Company of Fond du Lac, Wis., have been formally taken over by the Dawes syndicate. The purchase was made something over a month ago.——There are maintained, in Worcester, Mass., on public lighting account, 407 lamps of the Welsbach street lighting type, the supervision of which is in charge of the Welsbach Street Lighting Company of America.——The plant and franchise of the Doylestown (Pa.) Gas Company are under optional contract for sale to Philadelphia capitalists, at, it is said, an upset price of $30 per share.——The Rockford (Ills.) plant of the American Gas Company is to be rebuilt.——Mr. Isaac Battin, Treasurer and Engineer of the Omaha (Neb.) Gas Company, forwards his best wishes to his old-time Eastern confreres, and further remarks that any who travel West will find him ready to welcome them at the Omaha Company's headquarters, 1224 Farnam street. The Company shows a good increase in its trading for the past twelvemonth, despite the fact that the last comparison had to be made against the record noted during a "trans-Mississippi" year.——The proprietors of the Berlin Iron Bridge Company, of East Berlin, Conn., inform us that they have increased their capital stock to $750,000, and have made extensive purchases of land in Pittsburg, Pa., where they will start branch shops. They have placed orders for the greater portion of their machinery equipment, and the plans for the buildings, which will be quite extensive, are being prepared in East Berlin, and will be carried out by the Company. The purpose is that the Pittsburg plant shall be fully equipped with every modern appliance for performing every class of steel bridge and structural work. In fact, the Company's idea is to cause the Pittsburg plant to be the best of its type in America.

[Official Report.—Revised by the Secretary.—Continued from Page 411.]

## PROCEEDINGS, THIRTIETH ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held at Young's Hotel, Boston, Mass., Feb. 21 and 22, 1900.

### Second Day, Feb. 22—Morning Session.

The second day's proceedings were commenced pursuant to adjournment.

The President called for routine business, and the Secretary read the following

### Report from Committee on President's Address.

Boston, Feb. 21, 1900.

*To the Members of the New England Association of Gas Engineers:* Gentlemen—Your committee to whom was referred the address of the President would respectfully report that we have read with increased interest the very able address of the President, and commend it to the careful perusal of all the members. The technical details with which the address abounds demand the closest study, as they are of the greatest interest to all gas managers. We would recommend that the proposal of your President to appoint a Standing Committee on Electrolysis be adopted, and that a committee of three be appointed by the President.

We would also recommend that a committee of three be appointed, with power to increase their numbers, to represent your Association at the International Gas Congress, to be held in Paris during the Exposition, such selection to be made from among those of our members expecting to be in Paris at that time.

In closing we would particularly note the remarks of the President on the advance in the price of supplies entering into the manufacture of gas. We agree with the President that the increase in prices must largely reduce the margin between the cost of making gas and selling price; but we cannot help expressing the hope that the increase in manufacturing costs may not be so great as to necessitate an advance in the selling price of gas, though we fully appreciate that the result will be to delay the reductions in price which gas companies are always glad to make to their customers.

Chas. D. Lamson,
S. J. Fowler,
C. J. R. Humphreys,
} Committee.

On motion of Mr. Neal, seconded by Mr. Leach, the report of the committee was accepted and its recommendations adopted.

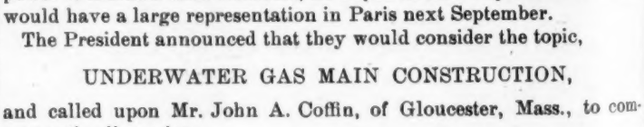
### Appointment of Committee on Electrolysis.

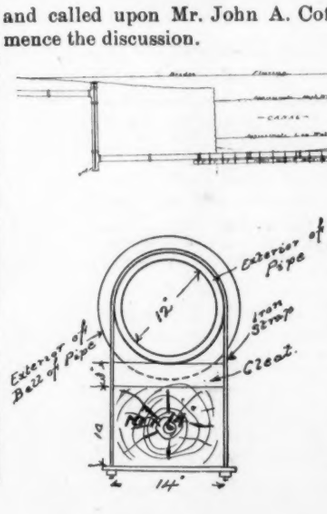
The President appointed as the standing Committee on Electrolysis Messrs. C. F. Prichard, C. H. Nettleton and H. A. Allyn. He further remarked that he would reserve the appointment of a committee to represent the Association at the Paris Exposition, and particularly requested that the members suggest to him the names of those likely to attend the Exposition. As the original committee of three would have power to increase their numbers, he hoped in that way the Association would have a large representation in Paris next September.

The President announced that they would consider the topic,

### UNDERWATER GAS MAIN CONSTRUCTION,

and called upon Mr. John A. Coffin, of Gloucester, Mass., to commence the discussion.






Mr. Coffin—At the request of our President I have brought a sketch of some work done in this line at Gloucester, and I will be brief in my remarks. It became necessary last summer for us to go under the canal (the Annisquam river), which connects Ipswich Bay with Massachusetts Bay, and the plan will show, much better than I could explain to you, our method of constructing that siphon. It was all tide water work, and we

could only work about two hours a day upon it, which was a little tedious, but it has been in use now since the first of August, and we have practically pumped nothing from the drip. We opened that drip for the seventh time the 1st day of February and it actually blew gas. One or two little wrinkles in connection with it I think are worthy of mention. In digging at low tide we had to deal with 18 inches to 2 feet of water, and had to go 2 feet below that to take the timber which supports the pipe from abutment wall to abutment wall. In doing that digging the shovel or scoop was of no use, as the bottom of that trench was some 4 feet from the top of the water at low tide. We tried a pair of horses on a plow with extended handles for ripping up the ditch, and then a hand scoop for dragging it from bank to bank. We found that the horses did not work very nicely, so we hired the city's steam roller. It made a very good team. We dredged that out. In the center we had a boulder, about a ton, that we drilled and blasted and dredged out the pieces. While I should not recommend to anybody with a similar job to undertake it themselves, but rather to employ somebody in that line of business, we accomplished it ourselves. All the help that we had was from some joint makers kindly furnished by the Boston Gas Light Company. The job is a complete success. In use since the first of August, it is bottle tight. To anybody that has anything similar to perform I do not know that I could suggest any improvement upon the method

Mr. Coggeshall—I should like to ask whether the pipe is of wrought or cast iron.

Mr. Coffin—Twelve inch cast iron pipe, about 1,100 pounds to the length, about 90 pounds to the foot, with about 4 inch bells made with lead joints.

Mr. Coggeshall—The reason you ran timber under there was on account of the mud underneath?

Mr. Coffin—No. Quite a number of stone laden vessels go through that bridge—it is a drawbridge—in the year, and they have been known to ground there on a falling tide. We put that timber there to support that pipe. It is a 10 x 14 hard pine timber, cleated every 3 feet, of the same depth as the bell, so that the pipe bears in four places, and an inch strap goes right round the pipe and timber. When we put that piece in we put the four lengths in together. We made them together on that timber, arranged a derrick on each bank, slung the pipe in the center of each section, with two bridles and four fastenings on it, and worked the derricks loose to get them to work together. As the tide fell the day that we put that in the ditch we followed the tide down. When it got about half tide we swung it off and lowered it away; at low tide put it in there. There is a very rapid current through that place (you can hardly stand on your feet) so that where we took down the abutment walls at each side we dumped rip rap stone across the channel, off 10 feet each side, to kind of break that tide. A diver was no use. We tried one twice. The tide would sweep him right out of the canal. You could not keep him in there.

The Secretary—Mr. President, I would like to ask Mr. Coffin what kind of joints were used?

Mr. Coffin—Lead joints, 4 inches in depth.

The Secretary—Stiff joints? Not an underwater joint? Ordinary lead joint?

Mr. Coffin—No; they are stiff joints. Yes, those are; only a little deeper than common. Where they are usually 3 inches these are 4. It was an extra heavy 12 inch water pipe, 90 pounds to the foot.

Mr. Allyn—I should like to inquire of Mr. Coffin whether this represents solid ground.

Mr. Coffin—*That* (indicating) is the surface and there is the wall. That wall is backed up with dump stone, and we had to go back that far to get that pipe underground and on natural bearings.

Mr Allyn—I thought there must have been some digging there.

Mr. Coffin—It was all dumped in back of those retaining walls with boulders. Rocks are plentier in Gloucester than gravel.

The President—Gentlemen, I think Mr. Coffin's remarks and his very clear drawing of the siphon will perhaps be more interesting to some of the members of the Association than even the more extensive constructions you will hear of later. Any further questions to ask Mr. Coffin?

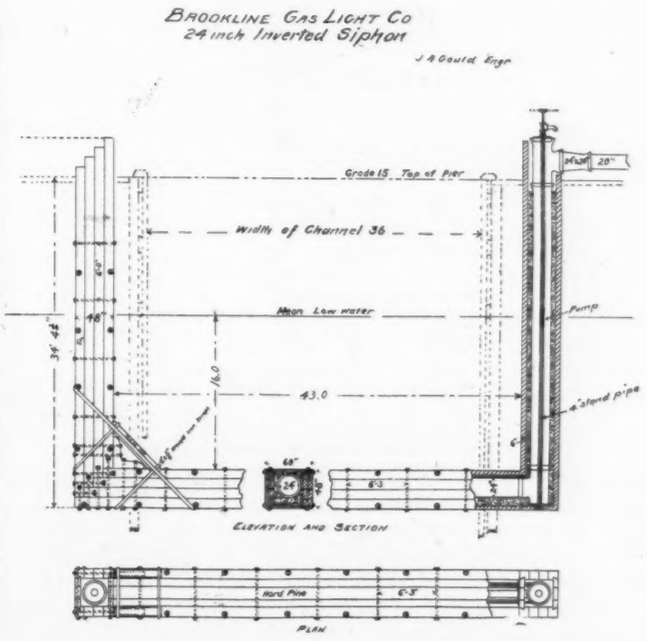
Mr. Neal—I have no questions to ask, but I will merely state that I have had some experience in the use of these siphons. One was under the draw of Chelsea Bridge. That was a wrought iron pipe laid by a diver. Once it was hooked up by an anchor. It is discontinued, because the bridge is now lighted by electricity. We have another small 4 inch siphon which we laid connecting our mains with the machine shop on the island over the Cambridge line. It has been in existence for a good many years with good results. The principal siphon (I think, 4 inch) is made of wrought iron, crossing near the draw on the bridge leading to Malden. The pipe furnishes gas to a large consumer in Everett, and also to the almshouse in Charlestown. Considerable gas is used there. The way we laid it there, we disregarded high water or low water; we cared nothing about it. The water is about 20 feet deep. We laid it by handling the pipe on the bridge and lowering it therefrom. It is of wrought iron with flange joints. The vertical part was put in position and then we lowered the horizontal part. Before we did that, the diver cleared away a level place for the pipe to lie in. After that was done, having made the bed as level as possible, we lowered the pipe and the diver put it together under water. The gaskets were covered with lead, and then the diver would come up and take them with him down into the water. I asked if the salt water would not wash off the cement, or at least whatever was used on the gasket, but it seems it did not. The diver would go down with it and fix it, doing the work under water. That pipe has been in existence quite a number of years. With regard to the drip, we hardly ever find anything in the siphon. It is very seldom we find any condensation whatever, although this pipe is in salt water and has been there for years.

The President—Did I understand you to say it was cast iron or wrought iron, and what size?

Mr. Neal—Wrought iron, and I think, 4 or 6 inch, probably the former. It is not large. The bridge is to be rebuilt very soon and then we shall put in a 6 or 8 inch cast iron pipe siphon.

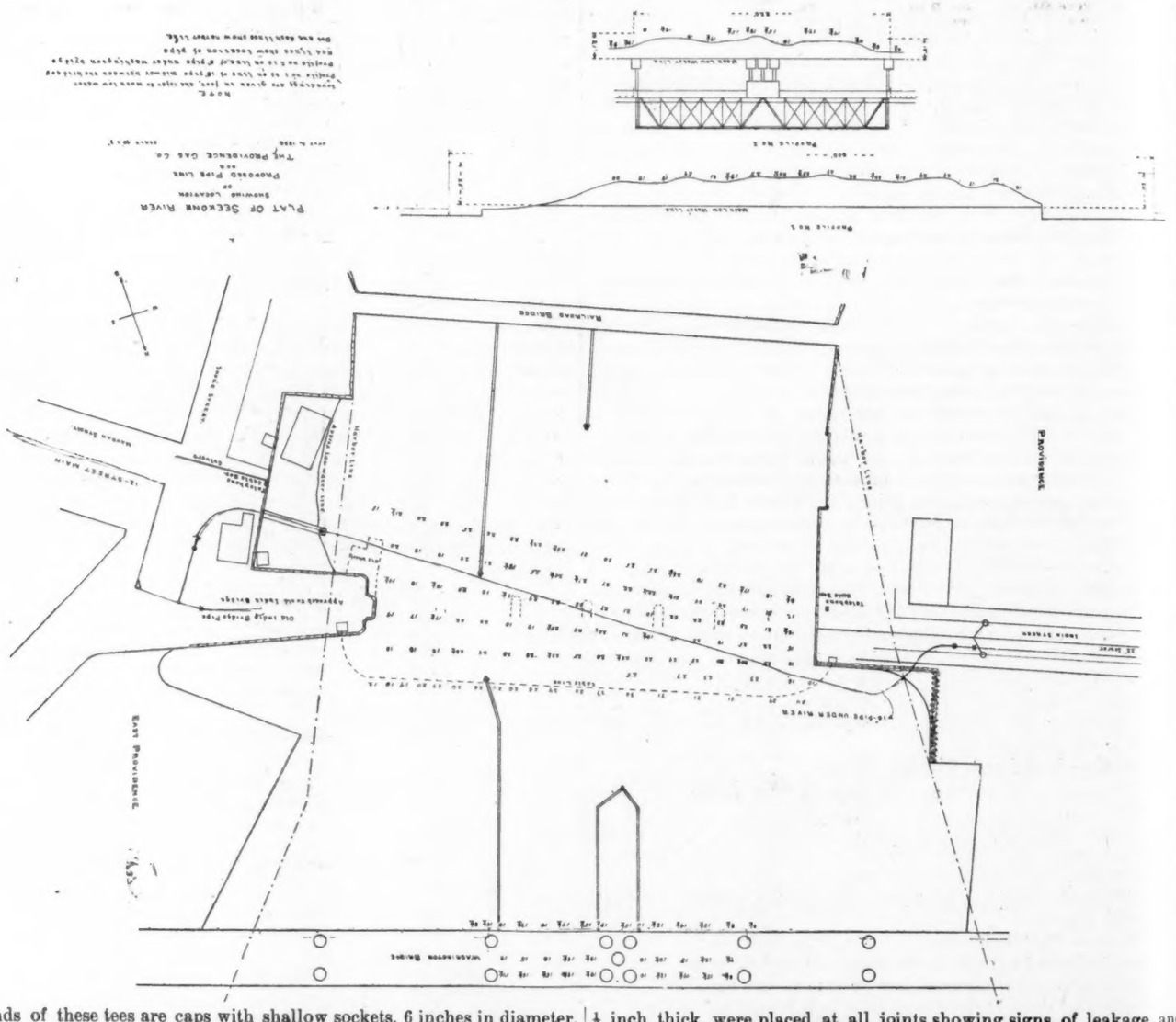
The President—Does any other gentleman wish to make any remarks on these smaller siphons. If not we will ask Mr. Gould to tell us something about the siphon put in by the Brookline Gas Company, which I had the pleasure of opposing for a long time—not for mechanical reasons, however.

Mr. Gould—In 1895 the Brookline Gas Light Company obtained permission from the proper authorities of the city of Boston, the State of Massachusetts and the National Government to lay a 24-inch siphon under Fort Point Channel, at Dover street bridge, for the purpose of conveying gas from the city proper to South Boston. The channel at this point is about 700 feet wide, but the draw opening for vessels is only 36 feet wide. The main is a 20-inch cast iron pipe, except the short section at the draw opening, and was laid on existing, or extensions to existing, pile structures built for supporting the water mains, but at the channel of draw opening, the pipe was enlarged to 24-inch, and was laid as an independent siphon under the channel. The siphon




was constructed as follows: A substantial box, 60 inches wide and 48 inches deep, on the outside, was built of hard pine timbers, with sides 12 inches thick, and top and bottom 6 inches thick. The timbers were bolted together with 1¼-inch bolts, and the angles were stiffened with hackmatack knees and iron bands. The pipe was laid in this box before the top was in place, and all spaces around the pipe were thoroughly filled with American cement concrete. The horizontal portion of this siphon is 51 feet long over all, and the two vertical arms are about 34

feet high. The siphon was built on a wharf on Chelsea Creek, about three miles from Dover street bridge, was launched on inclined ways into the water, and then floated by attaching a pontoon to it. On a pleasant Sunday morning, the siphon was towed through seven bridges to a position directly over its final location. The draw pier and wharf had been previously torn away and a trench dredged to receive the siphon, so that the top of the box under the channel should be at least 16 feet below mean low water. The water pipe siphons under this channel are only 15 feet below mean low water, which accounts for the moderate requirements as to depth. The siphon was floated into position at high tide and was quickly lowered into its present position, so that navigation was interrupted by the operation only during the ebbing of one tide. Any condensation or leakage that collects in the siphon is taken care of as follows: The up right and horizontal pipes are connected by tees. On the lower spigot

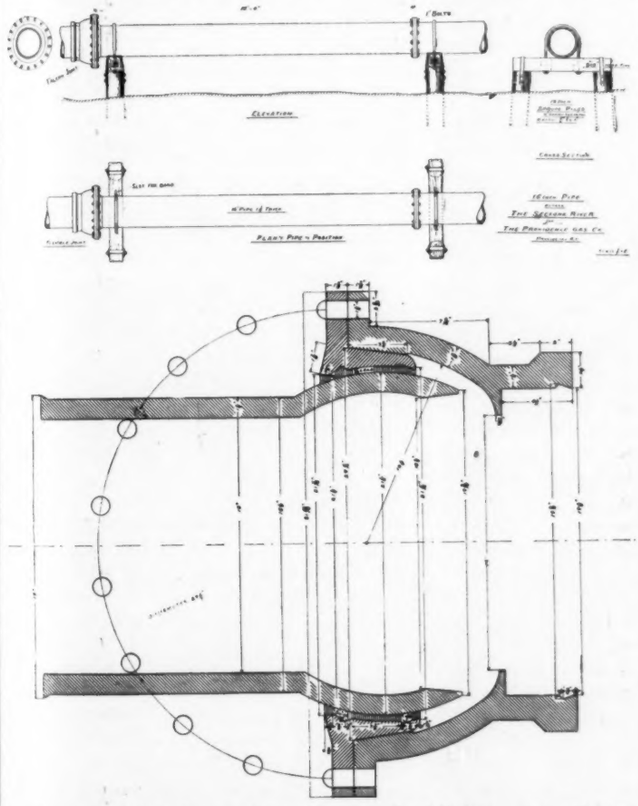


ends of these tees are caps with shallow sockets, 6 inches in diameter. A 4-inch wrought iron pipe sets into one of these sockets, and also extends up through a cap on top of tee at upper end of vertical arm of the siphon. A gas tight joint is made around this standpipe at upper cap, and a few inches of water in the lower socket will seal off this 4-inch standpipe from all gas from the main. Inside of this 4 inch pipe is placed an artesian well pump, at such a depth as to easily draft any water from bottom of siphon. It is possible to remove this pump at any time for examination or repairs, without interfering with the use of the siphon; but up to the present time the pump has not required any attention or repairs. The siphon was laid so that all condensation collects at one point where the pump is located. This drip receives the condensation from 110 feet of 24-inch pipe, 600 feet of 20 inch pipe and 1,100 feet of 10 inch wrought iron pipe (there being a double line of 10 inch pipe on the bridge over the railroad), and it is never pumped oftener than once a month. In fact, judging from our experience to date, we could safely omit pumping the drip for 6 months. The pipes on bridge and trestle are uncovered, as they make very pood condensers. The pipe in the siphon was made 24 inches in diameter so it could be examined on the inside after being laid. This proved a wise precaution in this case owing to the blunder of a man employed by the contractor to launch the siphon. While the siphon was resting on the greased ways, and before the anchor tackle had been attached, he deliberately knocked away the only remaining check on one way while the other arm was firmly anchored, the result being that one half of the structure slid into the water while the other half remained on the wharf. This caused a general wrenching and twisting of the siphon and its apparent destruction, but fortunately it was brought back into its normal shape and was then made water tight by working on the joints from the inside of the pipe. These joints were first caulked with cold lead, then cast iron rings, 22 inches in diameter on inside and ½ inch thick, were placed at all joints showing signs of leakage, and the space between these rings and the pipe was caulked with tarred oakum and cement. This latter operation was done after the siphon had been lowered into its final location and when it was under a maximum head of about 30 feet of water. The contract price of the siphon in place, exclusive of furnishing and laying the pipes in same, was $4,200.

The President—Gentlemen, you will observe a leading up gradually to the largest under water construction we have in New England. This will meet the requirements of fairly large cities. Are there any questions for Mr. Gould? Mr. Gould, it seems you made your remarks so full that they cover everything. Mr. Slater, may we ask you now to take the matter up with your construction in Providence.

Mr. Slater—Mr. President, I don't know whether you are quite right in saying this is the largest submarine pipe laid in New England. It may be requisite in the first place to explain the reasons making it necessary to lay the pipe across the river. This portion (indicating on

a map) represents the city of Providence, this locality is East Providence, and the two stations of the gas works are situated on the west side of what is known as the Seekonk river. Some 20 odd years ago we built a holder over there and supplied it by a portable connection over a drawbridge. The last year or two it became necessary to fill that holder almost every day in the winter, consequently if it were necessary for the draw to be taken up or laid off for a day or two we would be without gas, so we concluded to put a pipe across the river. That location represents a bridge about 1,600 feet long and there is a railroad bridge just below it, and the pipe crosses between the two. This blue print shows the preliminary examinations for the depth of water in the bottom of the river. It was deemed advisable, on account of the varying conditions of the bottom or bed of the river, to dredge out and drive piles. A channel about 12 feet wide was dredged out and piles driven, cut under water, a cross piece put on, the pipe laid on that and the cross pieces strapped down to 12-inch piles. These piles were something like 16 feet apart. The pipe is 16 inches in diameter and 1 inch thick. It was laid in sections, made up in sections of three pipe, and every third joint was a flexible one. This (indicating) represents a cross section of the bed of the river, and the red line represents the pipe as it was laid. We were obliged to put that pipe 25 feet below low tide, for



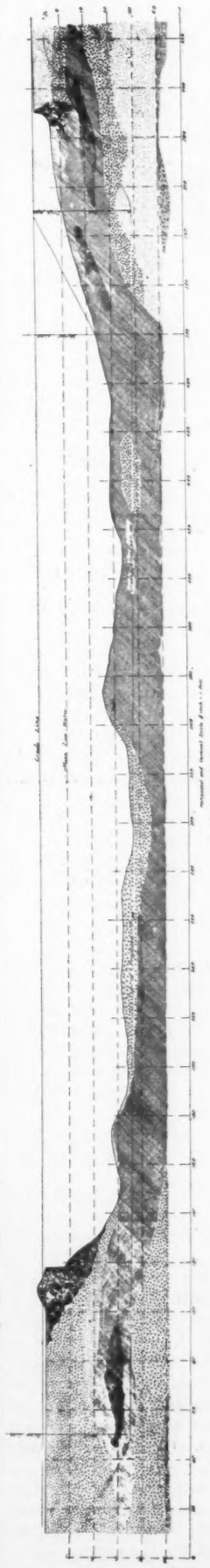
the Government dredged out there to a depth of 25 feet. It is about 60 feet across there, and the line is laid on a 4-ft. grade from one end to the other. By examining the profile you will see the conditions of the bottom, representing stone, sand, gravel, clay, shells and mud, and mud and shells. As I said, the pipe was made up in sections of three lengths of pipe, lead joints, every third joint a flexible one, invented by the contractor and patented. They would swing up a section of this pipe three lengths and drop it on to the timbers. Then the diver went down, lined it up and made his joints. It took him generally about two hours to do that. Then he would come up, get his straps and go down and strap it on, as shown by the other drawing there. The pipe was put in use the latter part of December and there is hardly any appreciable drip or condensation in it. The drip is on the easterly side, and 29 feet below low water. So far it has been a perfect success.

Mr. Allyn—I would like to inquire more particularly about this flexible joint, if Mr. Slater will describe it. There is a flexible joint in use in Boston.

(Mr. Slater handed Mr. Allyn a circular describing the flexible joint).

The President—Mr. Allyn, I would request you to give that circular back to Mr. Slater so that he may let us have the benefit of its remarks. I want to know something about that flexible joint too.

Mr. Slater—The circular reads in reference to the point inquired about:



Profile No. 1.

"It does not shut off the opening when it is at its greatest angle. The bell is large and roomy for the water to pass through. All surfaces and flanges are turned. The lead covers a long space on the body of the ball insuring its tightness. It is caulked on the inside and outside, and can be caulked any time after being laid, the same as bell and spigot pipes.

"The ring is smaller in diameter than the ball, so it cannot be pulled out after being bolted together without breaking the ring and bell; that is why we term it the double strength, ball joint. It will stand as much pressure as the pipe it is made for, and will remain as tight after being caulked. Contractors and divers will find this joint as represented, and easy to connect under water. When ordering joints state the weight per foot of pipe going to be used so as to insure a proper fit. All joints will be made with bell and spigot if not ordered otherwise." It is called the Falcon joint, and was invented and patented by the diver who did this work, Joseph G. Falcon, of Evanston, Illinois.

Mr. Sherman—We have had 800 feet of 16 inch pipe laid under identically the same conditions as represented on that blue print and by the same party some four years ago, and I can state that it gives satisfaction. There is very little drip. We only pump it out once a month. We laid it under the same conditions described by Mr. Slater, on piling and 25 feet below high water. It is a Falcon joint, and the line was put down by the same party that did the Providence work.

Mr. Slater—I think there is the difference that in the Seekonk river the current is very strong, whereas in Mr. Sherman's case there is little or no current.

The President—Mr. Sherman, they are bell joints, with every third one, in your siphon, the Falcon joint?

Mr. Sherman—Yes, sir. Those who went over the Shore Line in the old times as they crossed the bridge would see where we laid that pipe. It was just between East Haven and New Haven. Of course, they have diverted the track in the last two years, but all those who entered the city from East Haven would remember seeing the place where we laid the pipe. There is no very great current perhaps, but it is fully as deep as Mr. Slater's place was.

Mr. Slater—I might have stated that when this pipe was laid and connected on the shore ends an air pressure of about 55 pounds to the square inch was put on it and it stood 24 hours without any appreciable variation.

Mr. Sherman—I would say that at the time our pipe was laid a 24-inch water main was also laid on the same piling, and it has proved a success.

Mr. McKay—Will Mr. Slater give us an idea of the cost per foot of this pipe when laid?

Mr. Slater—We have not got the cost figured up yet, for we have not got all the accounts in. I suppose it will cost in the neighborhood of $24,000 or $25,000. The question was suggested whether we could afford to lay that pipe across there, it cost so

much money; but we were obliged to do it so that section of the city would not at any time be left in darkness.

Mr. J. J. Humphreys, Jr.—In this connection I might mention that at Toronto they had a water intake pipe, I think of cast iron, that ran out into the lake a considerable distance. During one of the winter months the ice gathered at the mouth of the intake, the water was pumped out, the pipe floated and became damaged. This is one thing to be thought of in connection with laying large pipes under water. You have to figure what weight they would float. You must have pipes heavy enough to hold down, or strap them down.

The President—That incident is rather interesting. I presume that was the intake for the water works.

Mr. J. J. Humphreys, Jr.—Yes, sir.

Mr. Allyn—I recollect that Mr. Lemoyne, who was formerly connected with Messrs. R. D. Wood & Company, showed me some plans of a flexible pipe, it might be called, that they had laid in several cases for water works. Their method at that time was to connect the pipes on a flat boat, and lower them down as they connected one pipe after another. None of the pipes were put together in sections and lowered as has been described by the other gentlemen. They were simply put together on this flat boat and lowered down into the river, and were all of the flexible joint type.

Mr. Sherman—The Standard Gas Light Company, of New York city, supply their North Harlem district with a 20-inch Ward joint main laid under the Harlem river. It has been successful, as far as I know about it. And Mr. Vanderpool used a Ward joint across the river opposite his works at Newark, N. J. Perhaps Mr. Allen, of the Allston works, who was Superintendent at that time of the Newark works, could give us some points about it.

The President—Will Mr. Woods, of the Standard Company, tell us something about the pipe under the Harlem river?

Mr. Woods—The 20-inch pipe we have crossing the Harlem river is fitted with the Ward reversible joint, laid, as Mr. Allyn said, from a flat boat. The vertical line was dropped in, and then one length taken after the other, until we got to the other side, a distance of about 600 or 700 feet. It worked all right till a dredge that was operating in the vicinity dropped its anchor pile into it and put 8 feet of it out of business. It took three or four weeks to get it fixed up, and since then it has been all right.

Mr. Hirt—Referring to the laying of pipes from floats, I remember, some 10 or 12 years ago, I happened to be at a meeting of the Cleveland City Engineers' Club, where a member read a paper saying that he had successfully laid pipe for water works purposes in the winter time on the ice, by cutting a groove through the ice. The pipe was made up of universal joints, lowered as made up till it reached the crib, when crib and pipe were lowered together and anchored.

Mr. Gould—As the laying of water pipe under water has been mentioned, I might state that several years ago I superintended the laying of 3,600 feet of 6-inch main from Moon Island to Long Island. These were cast iron pipes with the Ward flexible joint. The work was done on a large raft. After 4 joints had been made up the raft was pulled forward, allowing the pipes to slide off behind on a chute. As this operation continued the pipes trailed behind, like a chain with long links, and dropped into position on the bottom of the bay.

The President—Mr. Allen, Mr. Sherman suggested that you could tell us something about that underwater pipe connected with the Newark works.

Mr. Allen—Some years ago, when I was connected with the Newark Company, we had occasion to run two 12 inch parallel pipes across the Passaic river; I think the distance was about 1,500 feet. The work was given out by contract to a Mr. Ward, of Jersey City, who used a special ball and socket pipe. The first thing done was to dredge the river, forming a trench about 5 feet deep and 10 feet wide. They then undertook to lay the pipes from a float, by connecting two and three lengths together at a time and lowering them overboard, keeping one end of pipe above water in order to make the lead or ball joint to the next pipe and so on. The current of the river was so strong, and there were so many steamers going by, that they were obliged to abandon that scheme, after working on it for about a week and breaking several lengths of pipe. They then tried another plan. On the opposite side of the river was a marsh. They placed some planks and layed the pipes on rollers, connecting several lengths together, fastened a wire rope to one end and dragged the whole line across the river by means of two horses and a winch. A diver then went down and connected the two 12 inch pipes to two 24 inch flange tees on the vertical pipes; the lower end of these tees formed the two drips. There was a gradual fall in the two lines from the Harrison side over to the Newark side. After the pipes were all in place I think we pumped the drips several times during the 24 hours getting about a barrel of water every time. After the pipes had been laid 3 or 4 months the leakage finally dropped down to a few gallons. I believe to-day it is practically tight.

The President—I understand, Mr. Allen, that in getting it down we are to assume that a diver went down and caulked the joints?

Mr. Allen—No, sir; they were ball and socket joints. He went down and made the final connection at the drip on one side of the river.

The President—How did you decrease the leakage, from a barrel lot to a small quantity?

Mr. Allen—The leaks filled by themselves, with dirt, etc.

Mr. Sherman—Natural gas at Buffalo is brought into the city across the Niagara river about at Black Rock. I know nothing about the conditions under which the pipe was laid, but I noticed the current at that point in the river was very swift. They had no trouble in getting the pipes round there which supply Buffalo with natural gas from the Canada side.

The President—I assume from what has been said—there is nothing in the negative—that all these pipes are doing their work and have shown no material deterioration. I hear no objection to this statement, so I assume that that is so in every case we have heard from. Any further questions or any discussion?

Mr. Coggeshall—I have been very much interested in this matter as, at Oak Hill Road, was a bridge under which ran one of our pipes. Some days ago the great flood we had broke the pipe and carried it down the river. I shall run it underneath the channel the coming season.

The President—I guess you will find as a rule that will be safer. Anything more, gentlemen? If not, we will pass on to the next branch of the subject, which will be tunnels; and we will have the pleasure of hearing from Mr. Hirt again.

Mr. Hirt—The location of our pipe line and connections with the different gas companies necessitated the crossing of the river at three different places, namely: One 54 inch siphon at the Malden bridge; one 42 inch siphon at the Charlestown new bridge; and one 48-inch siphon at the River street bridge. In going through the customary form of application necessary for permits we found that the Malden bridge was to be rebuilt, and for the present, only temporary; therefore, we could not put in the ordinary wooden box siphon. The Charlestown bridge being a new one, the authorities did not care to have it disfigured with a wooden siphon, and the River street bridge was also likely to be rebuilt with some kind of ornamental design, being as it is on the Cambridge Park Way. All things being taken into consideration, we found it would be better to put our siphons through the solid material under the bed of the river. In looking into the different modes of construction of tunnels for this kind of work, it was, after careful consideration, decided to put in wood lined tunnels. The three tunnels were built on the same principle, which is as follows: A vertical shaft was sunk the proper depth, and until we met a good foundation, to carry the weight of the vertical pipe. The horizontal tunnel is started with the necessary air pressure to keep the water out, and is built up as fast as it is pierced in the following manner: The tunneling is carried on from 8 to 10 inches at a time, and as soon as room enough is made the wooden pieces, which are cut segmental to suit the radius of the tunnel, are fitted and placed in position. These segmental pieces are not over 12 inches long and are spiked together, breaking joints in a similar way for the building of a vertical stack. As the wood is dry when it is put in it becomes soaked with water, thereby swelling and making quite a tight tunnel. The whole of the tunnel is built in this manner, and but a small amount of leakage took place, and this, when the air pressure was taken off, could be easily pumped out, and once it was sufficiently dry the men could work in it and lay the pipe. The cast iron pipes were lowered and laid concentric to the tunnel, cement jointed and grouted all around the external surface of the pipe. In the Malden bridge tunnel we used taper bored joints, and crowded the grouting around the outside of the pipe by drilling holes in the upper part of the pipes when they were laid. From that point we made pipe connection with a 3-inch pipe to the surface of the street, where it was in turn connected with the box in which the grouting was poured, and was by gravity run down into the tunnel, filling the space between the pipes and wooden tunnel very satisfactory; the average head being not less than 60 feet, we had sufficient pressure to do the work well. The three tunnels have been built in the same manner, and we feel that we have a piece of work which cannot be disturbed by ice or boats; and in all cases we went deep enough to

keep away from the pile driver. This construction of pipes laid in the tunnel has brought forth an unexpected action; that is, the sweating of the pipes. We find that the effect of the outside temperature seems to govern the amount of water in the drip-pots on each end, and in some cases have pumped 16 barrels of water per day out of the Malden bridge tunnel (which is 850 feet long) and about 2 or 3 barrels out of the Charlestown bridge tunnel (which is only 260 feet long). The River street tunnel not being finished, cannot be reported on. We are, however, able to state that the quantity of water mentioned above is diminishing daily, and it looks as though it will finally come down to a standard amount every day. We also have at the Charles river bridge siphon a peculiar freezing action on our pump pipe. This tunnel is 260 feet long, while the exposed steel riveted mains are 360 feet long, connecting the siphon with the street main. The gas flowing in this thin steel pipe towards the siphon suffers a considerable reduction in tem perature, due to external cold air, in cold weather. This cold gas, on flowing down the vertical to the tunnel, absorbs heat from the pump pipe, causing the water in it to freeze to a deepth of 20 feet below the surface of the street. We evidently can overcome this difficulty by keeping the pipe empty. Next winter we may cover the steel pipes leading towards the siphon, to prevent this cooling effect on the gas. The pump pipe is similar to the one Mr. Gould is using at the Broadway siphon, which has been explained to you.

The President—Any further questions? I hope, gentlemen, I have succeeded in filling the gill, the pint, the quart and the gallon people. If there are no further questions, I am sure it is not necessary for any one to move a vote of thanks to these gentlemen, but I will put it to you at once. All those in favor of having the Chair convey the thanks of the Association to these gentlemen please say, "Aye." (The re sponse was a rousing "Aye.") Mr. Coffin, please accept the thanks of the Association; and Mr. Gould, Mr. Slater and Mr. Hirt also. We have all been very much interested.

*Completing the Discussion on Oven and Retort House Construction and Results.*

The President—I was very much disappointed yesterday because I felt that something was missing. I am sorry that the gentleman whom I am going to call upon was not then here, for his own sake as well as for ours; but as I think he can give us some very valuable information, in that he has very lately done some active work in retort house construction, I am going to call on Mr. A. B. Slater, Jr., even before he has had time to take breath. Mr. Slater—

Mr. A. B. Slater, Jr.—Mr. President, the only construction of the sort that I have had in hand recently was to rebuild a small retort house that it became necessary to renew on account of failure of the foundations as originally put in. The construction, therefore, was practically a matter of repair. We took down the old building, left the stacks of benches as they were, put in new foundations and then put up the new building. The form of construction used was steel frame construction, and as the retort house is really a continuation of another building, or what was another part of the same original building, we used brick filling to preserve a reasonable correspondence of outside appearance. The original building had the old-fashioned roof, commonly known as the gas house truss, made of light iron, and the trusses put in very close together in order to have the carrying strength necessary. In the present structure, the building being 110 feet long by about 65 feet wide, there are but four trusses between the ends, and those trusses rest upon the main columns, the roofing being carried by trussed purlins, spanning from truss to truss through the length of the building. The roofing was of the Melan construction (expanded metal and concrete) about 4 inches thick. The main trusses are 22 feet apart on centers, and the trussed purlins are about 9½ feet apart, and there is no other support for the expanded metal construction than those trussed purlins and the rafters of the main trusses. We put a slate covering on the outside of that, being the same slate covering that was used on the original building. The steel frame construction gave us an excellent opportunity for attaching our brackets to the lattice struts inside of the building, for supporting the mains from the take-offs to the exhauster room. In the side walls of the building we placed the usual doors, similar to what they were in the old building; but above them and near the jet we placed a row of wire glass windows, about 5 feet square, and there were two to each panel, the panels being about 22 feet. Those windows were steel pivot sash. They are arranged so as to be controlled from the floor, in order to give good light and ventilation.

The President—Mr. Slater, can we ask you something about the contents of the building?

Mr. A. B. Slater, Jr.—The benches?

The President—Yes, the benches and charging and drawing machinery.

Mr. A. B. Slater, Jr.—They are the same old benches that were there before. The stacks run crosswise of the building. The only change that we made with regard to them was simply to put our take-off main on the opposite side of the building from what it had been, so that, as we usually work the benches nearest to the take-off pipes, it enabled us to put the bulk of future work on the arches that theretofore had had the least work.

The President—May I ask were you using machinery for charging and discharging your retorts?

Mr. A. B. Slater, Jr.—No, sir; it is all hand work. The building simply contains two stacks of 10 benches of 6's each, and, being arranged crosswise of the building, they are not well placed for using machinery. In fact, the sendout from that works is not yet large enough to warrant the installation of machinery for operating those benches.

The President—Gentlemen, have you any questions to ask Mr. Slater? I don't believe there are many retort houses that have used the steel construction with the filling of brick, although such buildings can be seen at Everett.

Mr. A. B. Slater, Jr.—One point I would mention on the matter of brick filling is that it seems to be a common practice in the case of steel frame buildings for manufacturing purposes to leave the steel work exposed in the face of the building on the outside. That seems to me to be a very poor thing to do. In our case we simply pilastered around those columns on the outside, so there would be no opening for the weather to work in between the brick work and the steel work.

The President—I assume also that would tend to prevent expansion and contraction, Mr. Slater, would it not, as well as corrosion?

Mr. A. B. Slater, Jr.—Yes, sir.

Mr. J. J. Humphreys, Jr.—I would like to ask the method used by Mr. Slater to fasten the slates to the cement roofing?

Mr. A. B. Slater, Jr.—The expanded metal work was put in by first putting a floor of wood, "centering" we call it, between the rafters and purlins—the top face of the wood work flush with the top surface of the rafters and purlins—and on that was laid an oiled paper to prevent the wood from sticking to the cement. Then the expanded metal was laid and very strongly fastened together, the sheets lapping each other considerably. Then a coarse Portland cement and cinder concrete was laid on. While that was being laid by means of hooks the sheets of expanded metal were shaken up into the body of the cement, so that the metal was entirely covered on the under side. Then, on the body of course, there was a finish coat of Portland cement put on the outside, and then, before that had set too hard, the slate were placed and simply nailed on with galvanized nails, as is ordinarily done to a wooden roof. The cement as laid for such a purpose would not set so hard inside two weeks but what the slate could be satisfactorily nailed to it. In fact, this roof, where the slating was first begun, had set quite two weeks, but there was no trouble whatever in nailing the slate to the cement, just the same as would be done to a wooden roof. After the cement work had been set long enough to gain proper strength, all the wood work was entirely removed.

The President—May I ask if there is any cement between the slates?

Mr. A. B. Slater, Jr.—None, except a little spot of roofer's cement, as is usually applied, to keep the slate from getting a bad bearing on account of lumps in the slate. We used very large slate, and the surfaces were not as smooth as would be found in the first quality of Monson slate, for instance. These slates were very large; I believe they were 14 inches by 28 inches, having been made in that large size to accommodate the space between the purlins on the original roof, from which they were taken and applied to this roof. But there was no Portland or other hard setting cement applied between the slates; they were applied exactly as would be done in case of a wooden roof.

The Secretary—I would like to ask Mr. Slater to give roughly the approximate relative cost between the skeleton construction and solid brick for the wall.

Mr. A. B. Slater, Jr.—That depends so largely on the condition of the iron work that it would have to be considered for some specific time; but in general I should say that the cost of the steel construction, which includes the roof trusses, of course, with the columns for the side walls, made the whole building cost approximately the same as a building with all brick walls and an iron frame roof put on top.

Mr. Macmun—I would like to ask Mr. Slater with what he is going to fasten his slates in the future in case of repairs?

Mr. A. B. Slater, Jr.—The slate as at present nailed on had the nails driven into the cement, and the nails are so protected by the cement

that there is almost no possible chance for corrosion of the nails to allow the slate to get loose, excepting simply where the nails are in the slate, and the slates are so long and have so long a lap that we don't anticipate the necessity of any repairs. But should such become necessary I should, from the experience of others who have done similar things, expect no serious trouble in renewing the slate with an ordinary good quality of steel nails. In fact, even the galvanized nails have been used for repairs on a similar roof that was over five years' old. I don't know but that is apparently to say that Portland cement does not set very hard, but that has been done in fact, and I suppose the cinder body of the concrete explains it.

The President—Mr. Slater, pardon me for smiling, but I am a little struck with the fact that you quote the experience of some others who have had to repair their roofs. I think, with the way in which you did the work, undoubtedly you will have no repairs.

Mr. A. B. Slater, Jr.—I should say that those repairs of which I speak were caused by the falling of the top of a chimney on the roof and crushing the slate.

The President—The gentleman is now perfectly justified in his statement in regard to the permanent quality of the work of this roof. I am sure the Association will bear me out in giving the thanks of the Association to Mr. Slater. I think he has come over here at consider able personal inconvenience. The very fact that he was not here yesterday and was not with us last night I think shows that. Mr. Slater, we are indebted to you for coming over and giving us these remarks. Before we go to another subject—it is getting a little late I know—with your permission we will try the Question Box, apropos of retorts and retort houses.

The Secretary—One of the questions is:

> "In double stacks of retorts which arrangement is preferable—to have the benches set back to back, or facing each other, with operating floor between?"

The President—Is Mr. Snow, of Holyoke, here?

Mr. Snow—I don't know that I can advance any arguments to tell which way is preferable. That is one of the questions that frequently come up in gas works' experience that each man must answer for himself, according to his own likes, perhaps; also according to the conditions. I suppose I have been called upon because our arrangement is with two single stacks with the operating floor between them. Our retort house as originally laid out had a double stack. The time came when we had to build over the stack, and it seemed best for our purposes to divide that up into two. We have been very glad since that we did so. The arrangement is very satisfactory. There are a few points that strike us that that arrangement is preferable over the old style. It was surprising when we first had the work done to see how large our retort house appeared; the house seemed to be 50 per cent. larger than it was before. It puts all your available room into one space. While we had a working space between the old bench and the walls of about 20 feet, we get something over 31 feet now between the two benches. All the work is under the foreman's eye at one time. There is an advantage in seeing that work is going on right. Any stopped or leaking standpipe or mouthpiece is more apt to be observed quickly. Then, too, with this arrangement is another important feature that is very desirable, in that we can get to all the flues quickly and easily. We can get to the horizontal flue under the bottom retort both from the front and rear of the stack, which we have found to be a very decided advantage. There are, of course, a number of arguments against that style of construction. Two stacks will undoubtedly cost more than your double stack. You will have thicker rear walls to make up for having the benches back to back. But in our case we certainly feel that it has not been money thrown away. I don't know that we have been able to make gas any cheaper per 1,000 with this arrangement than with the other arrangement; but we can make it just as cheap.

The President—May I ask Mr. Snow if anything struck him in regard to the ventilation?

Mr. Snow—I didn't speak of that, because our old arrangement was short chimneys, which I think is not a well accepted arrangement. In our case the chimneys all came out in the building, and at certain conditions of temperature and wind the inside of that retort house was simply fearful. I never could see how the men stood it. I could not go in there and live apparently half an hour. The gases from the chimney seemed to settle right down on the floor. As regards the ventilation from ordinary smoke and dust, it is better under our present conditions than under the double stack back-to-back.

The President—I have my mind on one man, but I am not looking at him, whom I think can speak interestingly to us on this subject. Come on, Mr. Wood, let's hear something about it.

Mr. Wood—Mr. President, I think Mr. Snow hit it right in his opening remarks and that it is purely a local issue. He has also demonstrated by his remarks that what is one man's meat is another man's poison, because I have known of cases where the change has been made and the stacks split, which were formerly double, back-to-back, put on the side of the house, facing in. Where under the old arrangement the ventilation was perfect and working conditions were of the best, with the stacks facing each other such a set of currents and counter currents was set up that it was almost impossible for the men to work, especially if charges should not happen to be well baked. This was due to the smoke and steam from the drawing and the quenching of the coke down below in a 2-story house. In looking at it theoretically, and considering the questions of radiation, ventilation and economy of construction and floor space, a man would naturally say that the back-to-back would be the better construction. You really gain no floor space with single stacks and you put the men between two fires. Most of you know how hot it is in front of a stack at the side wall, even, if you have from 16 to 20 feet between the bench and the wall itself. It generally surprises people who are not familiar with the business to put their hands on that wall. If you concentrate those two fires and put the men between them to work, unless the distance is more than doubled, which it is not generally, because, as Mr. Snow says, you have to thicken the back walls and also leave a space for repairs between the back wall and the wall of the house, it seems to me that it is not as comfortable a place to work in as it is under the old conditions. It is also a question largely of how the coal and coke are to be handled, if it is to be manual labor or whether a large amount of machinery is to be employed, and, of course, the inclined question puts an altogether new light on the whole matter. As I understand it they were not successful in their first installations where the benches were built double, the stacks double, and the inclined charging mouthpieces were brought up through the brick work at the center of the stack. That, I believe, was the first arrangement and practical difficulties caused them to abandon that system. In the case of inclines a single stack seems to be a necessity.

The President—Mr. Wood, do you think it is a fair statement that the principal advantage in splitting the stacks is in having a single conveying machinery plant and having concentration of all your charging and drawing machinery?

Mr. Wood—I should say that was the great advantage.

Mr. Snow—Mr. President, just one further word regarding the heat between the stacks. If the works got to the point where they send out more or as much gas in summer as they do in winter I think our arrangement would be decidedly uncomfortable; but in smaller works, as we have always been able to do since we have had the arrangement, by a little managing, always having our summer work one one side of the house, the retort house is more comfortable now than it used to be. You can get farther away from the fire by having that 31 foot space in the center against the 21 between the bench walls and the walls of the building under the old arrangement.

Mr. J. J. Humphreys, Jr.—As a matter of economy, the increased radiating surface of benches not back-to-back would work against that arrangement decidedly.

The President—In reply to a suggestion, Mr. Snow has said, in his case, he could not notice any difference as regards the cost of gas. I assume from that he means there was practically little difference in the amount of coke used. Is that correct, Mr. Snow?

Mr. Snow—Practically you don't notice it. Theoretically the other position is sound, I think.

The President—It may be a very far suggestion, but possibly keeping the heat in the building may have something to do with offsetting the apparent disadvantage in not having the stacks back to back.

[To be Continued.]

## Susceptibility of Trees to Lightning.

The overseers of nine forestry stations in the dukedom of Lippe, in Germany, have made an examination of trees struck by lightning throughout an area of 45,000 acres, in order to ascertain for the German Government the susceptibility of various trees to lightning and its effects and occurrence in general. As a result of their observations, says the Philadelphia *Manufacturer*, it was found the oak tree was by far the most liable to lightning, in spite of the fact that they were not as frequent as other trees in the forest. The percentages of the various species were given as follows: Beech, 70 per cent.; oak, 11; pines, 13,

and firs, 6. During the several years through which these observations were made, 275 trees were struck by lightning, and of these 159 or 58 per cent. were oaks, 59 or 21 per cent. firs, 21 or 8 per cent. beeches, and 20 or 7 per cent. pines, the other varieties damaged being still less in number.

[Synopsis of Proceedings.—Continued from page 413.]

## SEVENTH ANNUAL MEETING, MICHIGAN GAS ASSOCIATION.

HELD IN DETROIT, MICH., FEB. 21 AND 22, 1900.

FIRST DAY, FEB. 21.—AFTERNOON SESSION.

President Walker called the meeting to order at 3 P. M., and announced the following

COMMITTEE ON NAMING NEXT PLACE OF MEETING:

Messrs. Paul Doty, F. J. Howden and D. H. Frazer.

Mr. George Osius, of Detroit, read the following paper on

### AMMONIA: ITS SAVING AND CONCENTRATION.

Mr. President and Gentlemen: Nearly 15 years ago, when it first was my privilege to discuss ammonia and its proper saving with you, but little attention was then given the subject, not for lack of interest, but its limited use had not then sufficiently stimulated the inventive mind which since has opened to us new methods, greater channels, new revenues.

Many gas works of small and large carbonization have profited by suggestions and recommendations made from time to time, and are now not only saving their gas liquor, but are efficiently equipped for its concentration. I, therefore, address my remarks more directly to small works carbonizing from 1,000 tons of coal per annum and more, and to such who as yet have given no attention to the saving of their ammoniacal liquor, but could readily and profitably do so if contented with an annual revenue of from 15 per cent. to 60 per cent. on their investment.

None of the by-products resultant from carbonization of coal have maintained their stability during all these years so well as ammonia, and this condition must necessarily lead us to the conclusion that it is not only a paying undertaking, but one of reasonable continuing certainty, to save your liquor, to utilize a waste, in its primary condition more harmful to your interests than objectionable. At first consideration this may seem exaggerating; not so, however, if you will follow me through a short description of how to save it, and subsequently how to prepare it for the market.

Let us, first, ascertain whether your scrubbing facilities are adequate for present requirements; if so, they will prove ample for what is planned. An examination of underground tanks should develop the existence of at least one large cistern or tank capable of holding about 5,000 gallons or more; two are preferable, but not absolutely necessary as will be seen later.

When this survey has been concluded with satisfactory results, nothing further is needed to perfect the preliminary, but important arrangements and possibly rearrangements.

Lead the liquor and tar from all sources of the works into one tank (A). If a second tank (B) of about 5,000 gallons capacity is available, connect tank A to overflow into tank B, and thereby create a storage tank for tar (A), and crude ammoniacal liquor (B) each. Should economy of money or lack of space debar you from the use of a second tank, tank A should be provided with a simple but effective separating device. Divide the tank into two compartments, and if the tar is readily sold select the larger part for the liquor. Let the partition extending from wall to wall come up from the bottom within about 12 inches of the top of the tank. Partition the top of the tank from wall to wall to about 6 inches below the top of the other partition, and, say, 2 inches apart. The side which is divided by the downward extending partition should be used as a receiver for tar and liquor. The heavy tar will quickly fall to the bottom; the light tar and oil are kept on the same side, but are given time to finally settle. The liquor passes between the partitions, practically skimmed over, to the other side in which the clear liquor is accumulated. The liquor side is connected to an ammonia pump, its suction pipe extending not less than 6 inches from the bottom.

When this equipment is completed, place a tank as large as practicable above the scrubber to serve as a feed tank for the same. The liquor taken from the liquor tank passes through a jet or spray, and is now used in place of fresh water, returning again to the tar side of tank A, where it deposits its tar and overflows into the second partition, or tank B. If a second scrubber is available, wash in the first one with liquor, and use the second one for a final scrubbing with fresh water. The continuous influx of hydraulic main liquor will check the increasing strength of the liquor returning from the scrubber, and it is thereby that an average strength of about 2½° Twaddle is obtained.

This procedure, although preliminary to a further treatment of the crude ammoniacal liquor, is not only the most important part of the work, but large quantities of ammonia are fixed which otherwise would have to be eliminated by the purifiers. Not only this, but at least a gallon of tar per ton of coal carbonized is saved by the described mode of settlement, which would pass off into the sewer or stream by being carried away with the liquor. It is, therefore, apparent that the cost of a second cistern, or of proper provisions of saving the crude ammoniacal liquor, will soon be returned manifold.

Now, as for the proper concentration of the liquor. Your attention should be devoted to the selection of a concentrator, which not only is of approved construction but is also compact in its arrangement. Time is money; space is value. Let me, therefore, suggest in a general way that in its construction every available advantage must be embodied. The treatment of liquor in a large quantity at any one point must be avoided. The more the same can be distributed in the apparatus, the quicker and better results will be obtained.

Its construction must be such that no complications can arise during its operation. All parts should be so arranged as to permit inspection at all times. The apparatus should occupy but little space, and its construction should permit of erection or removal without the expense of costly preparations. It should also be a labor saving process, or the expense of its operation will absorb the profits. Its capacity must be sufficient to permit of operation at intervals, and it should then be able to distill in a few days the accumulation of crude gas liquor of weeks, perhaps of months; therefore, the advantage of a large storage capacity is apparent. The capacity of the apparatus should be at least equal to the highest amount of any one day's production of gas liquor. The simplicity of construction will avoid additional labor, an important advantage, since the comparatively small amount of annual proceeds from the utilization of ammoniacal liquor at small works demands economy in all.

While fuel is an item of not so great an importance with gas works as it may be with other industries where all of it must be purchased, it should, however, be taken into consideration, and the construction of an apparatus should be based upon principles, allowing heat, one of the main factors in concentration, to be utilized to its full extent. Last, but not least; the material used in the construction of a concentrator should be the best. Cast iron should be used in the still proper, lead pipe be applied where practicable, and cocks coming in contact with ammonia should be asbestos lined, ammonia cocks.

If you are then satisfied that all these requirements are fulfilled in the use of such an apparatus, there is nothing to prevent the adoption of a successful and paying device. Assuming, then, that you have obtained what is here described, the apparatus will reduce the quantity of crude gas liquor to about one-tenth of its former bulk, by means of liberating the ammonia gas contained in the crude gas liquor and transforming it by condensation into a liquor of high strength and of market value. The same is collected in an absorber (part of the apparatus), and runs into a storage receptacle large enough to accumulate a shipment, which can either be made in tank cars or in iron drums. The latter should be avoided, if the location of the gas works is close to railroad tracks, and if the annual production of concentrated liquor is about equal to a shipment of not less than 4,000 gallons. Concentrated liquor should be stored in iron tanks only, and these should be placed in a manner permitting easy examination for leaks and defects. Protect it from exposure to heat, thereby reducing the possibilities of forced leaks to a minimum.

After a concentrator is properly erected the following directions for operation may be successfully followed, though local conditions may call for modifications here and there.

#### STARTING.

1. Fill the supply tank, by pumping gas liquor of about 1¼° T. strength into it from the well.
2. Fill the cooler with water, and have it at from 110° to 120° F.
3. See that the large absorber contains enough concentrated or crude gas liquor to sufficiently seal the lead pipe inlet.
4. Fill the small absorber about three quarters full with clean water.
5. Turn on the steam. When it blows out of the pet-cock on top of the seal, close this cock, open the cock at the inlet to the small absorber,

and gradually heat the apparatus until the temperature at the inlet pipe to the cooler has risen to about 175° F.

RUNNING.

1. *Gas Liquor.*—Have the pump working fast enough to keep the supply tanks full. Open the cock in the pipe nearest the supply tanks fully, and keep it there. The other cock in this pipe is to be set and only used for regulation. Increasing the flow increases the strength of the concentrated liquor; decreasing the flow decreases the strength of the liquor.

2. *Steam.*—Keep the valve before the steam regulator open to its full extent. More steam, which can be obtained by adding weights to the regulator, will produce weaker concentrated liquor. Less steam, which can be obtained by removing weights from the regulator, will produce either stronger concentrated liquor, or will not liberate all the free ammonia as can be detected by the smell of ammonia in the discharge. Test this occasionally. Keep the regulator clean, and oil its piston occasionally to insure regular and easy working.

3. *Temperatures.*—Keep the temperature of inlet pipe to cooler at from 170° to 180° F., according to the strength of the crude liquor in the well. The weaker the liquor the lower this temperature should be, and vice versa. This temperature is maintained by regulating the quantity of liquor flowing from the supply tanks. Keep the temperature of the water in the cooler at from 110° to 120° F., by allowing more or less cold water to flow into it. The pipe between the cooler and large absorber should always be lukewarm.

4. *Test.*—After well started, test the concentrated liquor at the outlet of the still occasionally, and keep it at about 26° T., when first drawn off.

5. *General.*—When the concentrator clogs with "salt," as will be shown by the discharge seal blowing, shut off the gas liquor supply, steam small absorber, open the petcock on top of the seal, and shut off the water in the cooler. Then steam out the pipe leading to the cooler and absorber, until the heat has dissolved the salt. The pipe leading from the large absorber to the storage tank should also be examined. When this has been done distillation may be resumed.

Empty the small absorber as soon as its contents reach about 2° T. into the crude gas liquor cistern, and produce a strong ammonia odor. Then refill with fresh water.

Tar will cause trouble in the column. Beware of the smallest leak in the large absorber and concentrated liquor tank, as it will cause serious loss by escape of gas.

On extremely cold nights, and if the apparatus is not being operated, run the liquor remaining in the supply tanks back into the well, also empty cooler of its contents.

STOPPING.

1. Shut off the gas liquor supply and water running to the cooler.

2. When the liquor running into the large absorber falls to 10° T., shut off the steam.

3. Quickly shut off the small absorber, and open the petcock on top of the seal.

As I have had the honor of reading papers on similar subjects before other Gas Association meetings, it has obviously become necessary to repeat myself occasionally in fully demonstrating the object of our discussion, and I hope, therefore, that you have followed me with your kind indulgence, trusting, however, that my remarks may have proved of some advantage to all.

After a lengthy discussion a vote of thanks was passed to Mr. Osius.

Mr. Paul Doty, of Grand Rapids, Mich., then read his paper entitled

## METER TESTING.

Newbigging lays down, as the second of his "Golden Rules for Gas Managers," "Keep up the efficiency of the meters." The importance of this rule is so generally admitted, that to write on this subject simply implies a description of a system of meter testing and records, and a report of the results of testing over 5,000 meters in the past two years.

The use of the word efficiency by Newbigging suggests the thought of the meter as a motor or machine, and, in a general consideration of the theory of machines, a fundamental view requires a determination of its efficiency, or the ratio of the useful part of its work to the whole expenditure of energy. The meter is required to deliver the entire volume of gas supplied to it without loss other than the pressure absorbed by the meter in motion, or the efficiency should be 100 per cent., and since experience has repeatedly shown how well the meter fulfills this requirement, I take this opportunity of expressing my respect for the meter as a machine and my belief in the integrity of its measure of the volume of gas sold.

The determination of the efficiency of the meter requires a system of testing. The meter delivers and measures a volume of gas, and the standard or unit of measure is a cubic foot. The laws of Massachusetts and Ohio define this standard, and in these States a meter is accepted as correct when registration of the measured volume varies not more than 2 per cent. in favor of the company, or from 2 per cent. to 3 per cent. in favor of the consumer. The "Sales of Gas Act" in England likewise prescribes these limits. Michigan, I believe, has no regulation covering the accuracy of the meter. It is good practice to consider as correct a meter whose variation does not exceed 1 per cent. fast and 1½ per cent. slow. The meter manufacturers will accept these limits in selling meters, and it is to the credit of gas companies to require and maintain a higher standard of efficiency than is required by law.

It is not my intention to draw comparisons between the several excellent meters as to capacity, durability, and accuracy; nor do I discuss the old question regarding the testing of meters in place or otherwise. There is no doubt but that old meters removed while in use and tested in place will show different results than when tested in the proving room under proper conditions. A portable prover may be of value as an indicator of possible conditions, but when it is considered that a primary object of meter testing is to "keep up the efficiency of the meters"—and this requires that adjustment tests be made, valves cleaned periodically, diaphragms cleaned and oiled, or new diaphragms, painting and other examination and repairs—it will be seen how necessary it is to get the meters in the shop periodically. I believe it is good practice to day to get the meters in the shop for test and repair at least once in three years. If this be done the office manager has a comfortable assurance of the accuracy of his meters and the correct registration of the gas sold, if occasion for doubt arises with a consumer.

The consumer can be welcomed cordially to the proving room to witness the test of the meter for accuracy, and convincing proof can be shown of the value of a high standard of work in the testing and maintenance of the efficiency of the meter. Our system of testing meters provides for the following instructions:

1. Have water and air in the prover, and the meter to be tested, at the same temperature. The meter should preferably remain 24 hours in the proving room previous to test.

2. Insure tightness of apparatus, by testing meter and connections for leakage.

3. Set index of test dial on upward stroke, starting at dial point.

4. Run air from prover through meter with outlet open full, making two revolutions of test hand. This is known as the first capacity test with open outlet, or "heavy" test. Note the prover reading on meter test slip, and obtain per cent. of error of meter from meter prover tables. During this test note pressure gauge for "sticks" or "jumps."

5. Run air from prover through meter with cap or check on outlet, making two revolutions of test hand. This is known as the second capacity test with check or cap outlet, or "light test," and is the normal test, or at the rated capacity of the meter. Note prover reading as above. (4.)

6. Run air from prover through meter with outlet open full, making two revolutions of test hand. This is the third capacity test, or "heavy" test repeated. This final open outlet test should be compared with first open outlet test to determine whether the meter holds proof. First open outlet test and final open outlet test must agree within 2 per cent. of each other. Check outlet test and final outlet test must agree within 3 per cent. of each other; meters which fail in this test must have valves reset. Meters which comply with above condition will be accepted as correct, which prove within the limits of 1 per cent. fast and 1½ per cent. slow on normal test. The normal test is the record test shown on the meter record book. Meters exceeding the above limits on the normal test, and not exceeding 4 per cent. plus or minus error, will be adjusted. Meters exceeding 4 per cent. plus or minus error on normal test will require examination and repairs.

7. Meters which pass "correct" through capacity tests will be tested with gas to see whether the flame is steady. Use an Argand burner connected to meter outlet for making this observation. Meters failing in this test "flicker" or "jump."

8. Meters will now be tested with gas to see whether they register on a small flame or pilot light. Use a Welsbach bye-pass or center tube pilot light connected to meter outlet for making this observation. Meters failing in this test, "non-register on small flame."

*N. B.*—It is understood that a record of all tests is to be made on the meter test slip provided.

The meter test slip form is shown herewith:

*Grand Rapids Gas Light Company.—Meter Test Slip.*

Received.....189....

New. Shop. Use.

.....

Company's No..... ...Size.....

Maker's Name ..... Maker's No. .....

Index received.....Index set.....

Date tested.....

Date adjusted.....

Date set.....

Date sent to shop.....

Tested by.....

| Date Test. | Cu. Ft. of Gas or Air Passed Prover. | Meter. | Test. Fast. | Slow. | Temperature. Water. | Air. | Pressure. |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Date Local repairs By

| | | | | |
|---|---|---|---|---|
| Leaks In Case | Sticks | Valves to be Set | Non-Register Small Flame | Adjust |
| Leaks In Diaphragm | Jumps | Does not hold Test | | Repair |

The slip is attached to the meter when it is received in the shop. Space is provided to note by check mark (✓) from what source the meter comes. "New" means new meters; "shop" means meters returned after repair from the outside meter repair shops; "use" means removed from use in consumers' premises. The other data required on the face of the slip are self-explanatory. The slip remains with the meter while it is in the company's shop. When it is disposed of by being set or sent to the repair shop the slip is removed and turned into the office for record.

The data shown on the reverse of the slip are self-explanatory. Local repairs include only the work classified by the meter manufacturers' repair shops, as "cleaning" or "examining," or class "A;" and "cleaning and oiling diaphragms," or "general repairs" or class "B." The work designated as class C., or putting in new diaphragms, we turn over to the meter manufacturers.

At the end of each month the meter test slips are assembled at the office, and the record of test of meters is prepared in the form shown below: Only meters from "use" are entered. "New" meters and "shop" meters having seen no service are all within the "correct" limits before being set, and naturally would give no information of value for the record of the efficiency of the meters in service. No special record is kept of the efficiency of the individual meters of different makes. Any old meter may have been repaired in several different shops, and the only part of the original meter may be the name plate. It is understood the test slip is entered in the Meter Record Book, which contains the complete history of the meter from purchase to finish. In this book space is provided for company's number of the meter, or "property number" sometimes so called, maker's name, maker's number, size, kind, date purchased, date set with index of test, date removed with index and location, date tested, record and location, repaired, record of repairs, by whom repaired, date condemned or destroyed, and a column for remarks. This is a valuable book of record, and entries are carefully made. I recommend the company number system of record, which I believe is now generally adopted, and its value where in use is well understood.

I give the record of the test of meters from "use," at Grand Rapids. These tests were made between May 1st, 1898, and December 31st, 1899. A number of very old meters are included in this record which adversely affects the showing. A good standard of efficiency requires that 70 per cent. at least of the meters are in condition for use. It is quite probable that, even with the three years' limit, not more than 70 per cent. of the meters will prove within the "correct" limits, 20 per cent. within the "adjustment" limits, and 10 per cent. in the "repair" limits. Then, again, many of the meters which pass "correct" through the capacity tests will fail in some of the auxiliary tests and require examination or repair. The record shows 53 per cent. of the meters test slow. This I believe simply confirms previous experiences, and it is safe to assert that a majority of meters in service are slow, or register in favor of the consumer. I believe the net error or quantity of gas unaccounted-for by inaccurate registration to be between ½ of 1 per cent. and 1 per cent., or, in other words, the efficiency of the meter as a measuring machine is between 99 per cent. and 99½ per cent., certainly a high standard.

I give the record of the test of 790 new meters: 199, or 25.19 per cent., are "O. K.;" 222, or 28.10 per cent., are "fast;" and 369, or 46.71 per cent., are "slow." All within the correct limits of 1 per cent. fast and 1½ per cent. slow.

During 1898 and 1899 we expended for meter repairs $5,403.04, or at the rate of $1 per meter tested from "use." This I believe is the average experience. The average earnings per meter in three years may equal $100, the average cost of maintenance is $1, or 1 per cent. of the amount registered. This at dollar gas gives the cost of maintenance of the efficiency of measurement at 1 cent per 1,000. This is a small cost indeed, yet I venture the assertion that 60 per cent. of the gas companies throughout the country do not expend this amount in maintaining the standard. There are many companies no doubt who spend more than this, and find it a saving and paying investment. I trust the importance of correct registration of gas consumed will appeal with sufficient strength to those at interest, that with the return of prosperity and the restoration of confidence in the country at large, the gas industries will share in the gain, confidence will be placed in us, and the security of our companies will be made doubly sure.

A vote of thanks to Mr. Doty, concluded the sessions of the first day, pursuant to a motion to adjourn to 10:30 A. M., Feb. 22d.

(To be Concluded.)

*Grand Rapids Gas Light Company's Record of Test of Meters from May 1st, 1898, to December 31st, 1899.*

| Size. | No. Tested. | Correct. O.K. | 1.00 Per Cent. or Less Fast. | 1.50 Per Cent. or Less Slow. | Total. | Adjust. Fast. 1.00 to 3 Per Cent. | Fast. 3 to 4 Per Ct. | Slow. 1.50 to 3 Per Cent. | Slow. 3 to 4 Per Ct. | Total. | Repair. Fast. 4 to 6 Per Ct. | Fast. 6 to 10 Per Ct. | Fast. Above 10 Per Cent. | Slow. 4 to 6 Per Ct. | Slow. 6 to 10 Per Ct. | Slow. Above 10 Per Cent. | Slow. Will not Register. | Total. | Leaks in Case. | Leaks in Diaphragm. | Sticks. | Jumps. | Valves to be Set. | Does not Hold Test. | Non-Register Small Flame. | In Condition for Use. | Out Condition for Use. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 1 | ... | ... | ... | ..... | ... | ... | ... | ... | ..... | ... | ... | ... | ... | ... | ... | 1 | 1 | ... | ... | .. | .. | ..... | ... | ... | ..... | 1 |
| 3 | 1,346 | 109 | 218 | 267 | 594 | 175 | 99 | 100 | 65 | 439 | 127 | 50 | 15 | 54 | 43 | 9 | 15 | 313 | 43 | 142 | 8 | 53 | 724 | 214 | 11 | 347 | 999 |
| 5 | 3,651 | 360 | 611 | 1,101 | 2,072 | 318 | 117 | 410 | 231 | 1,076 | 103 | 42 | 11 | 215 | 98 | 22 | 12 | 503 | 41 | 179 | 12 | 37 | 1,532 | 563 | 7 | 1,435 | 2,216 |
| 10 | 161 | 8 | 27 | 44 | 79 | 17 | 4 | 25 | 13 | 59 | 5 | 3 | 1 | 6 | 6 | 2 | .... | 23 | 3 | 21 | .. | 6 | 90 | 27 | .... | 43 | 118 |
| 20 | 32 | 2 | 6 | 10 | 18 | 4 | 1 | 3 | 1 | 9 | 2 | 1 | ... | 1 | 1 | ..... | ..... | 5 | 1 | 4 | .. | 1 | 12 | 6 | .... | 13 | 19 |
| 30 | 13 | ... | 4 | 6 | 10 | 1 | ... | 1 | ... | 2 | ... | ... | ... | 1 | ... | ..... | ..... | 1 | .... | ..... | .. | .. | 1 | 1 | .... | 9 | 4 |
| 45 | 4 | ... | ..... | 1 | 1 | 1 | ... | ..... | ... | 1 | ... | ... | ... | 2 | ... | ..... | ..... | 2 | .... | ..... | .. | .. | 1 | ... | .... | 1 | 3 |
| 60 | 4 | ... | ..... | 1 | 1 | 1 | ... | 2 | .. | 3 | ... | ... | ... | ... | ... | ..... | ..... | ..... | ... | 1 | .. | .. | ..... | ..... | ..... | 1 | 3 |
| 80 | 1 | ... | ..... | ..... | ..... | .. | ... | .... | 1 | 1 | ... | ... | ... | ... | ... | ..... | ..... | ..... | .... | ... | .. | .. | ..... | ..... | ..... | ..... | 1 |
| 100 | 2 | ... | 1 | 1 | 2 | .... | ... | ..... | ... | ..... | ... | ... | ... | ... | ... | ..... | ..... | ..... | .... | ..... | .. | .. | ..... | ..... | ..... | 2 | ..... |
| 150 | 1 | ... | ..... | ..... | ..... | .... | ... | ..... | ... | ..... | 1 | ... | ... | ... | ... | ..... | ..... | 1 | .... | ..... | .. | .. | ..... | ..... | ..... | ..... | 1 |
| Total. | 5,216 | 479 | 867 | 1,431 | 2,777 53.24% | 517 | 221 | 541 | 311 | 1,590 30.48% | 238 | 96 | 27 | 279 | 148 | 33 | 28 | 849 16.28% | 88 | 347 | 20 | 97 | 2,360 | 811 | 18 | 1,851 | 3,365 |

Total number O.K., 479; 9.18 per cent. Total number fast, 1,966; 37.69 per cent. Total number slow, 2,771; 53.13 per cent. Total number found to be in condition for use, 1,851; 35.49 per cent. Total number found to be out of condition for use, 3,365; 64.51 per cent.

## The Equity and Expediency of Distributing Different Qualities of Gas Throughout the Twenty-Four Hours.

By Mr. E. H. YORKE, Portland, Me.

The distribution of a uniform quality of gas throughout the 24 hours is the common practice among gas companies. This practice has been continued, from the beginning of the distribution of an enriched gas to the present time, without apparently any question as to the wisdom of it, for reasons which largely appear to be because, "It has always been done that way."

But that there exists some considerations for a change in this practice will be evident when an enquiry is instituted into the factors involved. These factors will be found to be: First, the fact that in each 24 hours there are two periods—*i. e.*, a period of darkness and one of daylight, averaging throughout the year of about equal lengths, in which the requirements for the use of gas generally speaking are of a totally different character. Secondly, the item of leakage.

If gas companies were free from that unavoidable, continuous, and costly tax upon its resources known as unaccounted-for gas, the distribution of a uniform quality of gas throughout the 24 hours would be unobjectionable. If all the hours of the 24 were hours of darkness, a uniform quality would an absolute necessity.

But inasmuch as one half of all the time in each year is daylight, and during this period the requirements for artificial light are but slight and could be satisfactorily served with an uncarburetted (coal) gas, the question, then, of the distribution of such a gas during daylight (in view of the saving in cost of enrichment which would follow), becomes an important one.

The practical waste of all the enrichment, when enriched gas is distributed during the daylight, through leaks in mains and services, the present high price of enriching oil, and the constant demand for a lower price of gas would serve to furnish an emphatic affirmative, especially during the summer months.

Beyond this, in a broad sense, the interests of the gas company and the consumer being mutual, it follows that any economy attained by the gas company must in the end conserve equally to the advantage of the consumer. That this uncarburetted gas would have a lower heating value is conceded, but the difference to the average individual consumer would be unappreciable, while the saving to the gas company would be of a material amount.

The practical results and economy which follow the adoption of this plan I will omit, as the saving which may be effected in the different works would vary with the different conditions.

That there are two classes of companies—*i. e.*, the small company with but one holder, and the large with widely scattered holders which must be filled during the hours of daylight—which could not adopt this plan without difficulty goes without saying.

## ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

AT the annual meeting of the Paterson and Passaic (N. J.) Gas and Electric Company the following officers were chosen: Directors, Wm. Barbour, E. T. Bell, Bird W. Spencer, B. M. Shanley, John R. Lee, W. B. Gourley, Randall Morgan, J. W. Ferguson, John Reynolds, Hobart Tuttle and John Agnew; President, William Barbour; First Vice President, E. T. Bell; Second Vice President, B. W. Spencer; Treasurer, Louis Lillie; Asst. Treasurer and Secretary, W. H. Rogers.

THE consolidation of the lighting interests of Chico, Cal., has virtually been perfected. The succeeding corporation is to be known as the Chico Gas, Electric Power and Lighting Company, and its officers are: Directors, O. L. Clark, Thos N. Crew, E. Meybem, A. F. Johns, E. B. Collins, Park Henshaw and Thomas Bicknell; President, O. L. Clark; Vice-President, Thos. Bicknell; Secretary, Thos. N. Crew; Treasurer, E. Meybem.

MESSRS. H. E. Gawtry and Oscar F. Zollikoffer, representing the Consolidated Gas Company of this city, last Monday filed with the Secretary of State a certificate of increase of the Company's capital stock, from $39,078,000 to $54,595,200. The increase ($15,517,200 at par) was voted in special meeting of the shareholders to redeem the Consolidated Company's issue of debenture bonds to take up the stock of the New York Gas and Electric Light, Heat and Power Company, aggregating at par the sum of $36,000,000.

A CORRESPONDENT in Marysville, Cal., forwards the following: "Negotiations which have been in progress for some time were recently concluded whereby the local gas and electric lighting interests, heretofore conducted respectively by the Marysville Gas and Electric Companies and the Yuba Electric Power Company, will be conducted by the Marysville Gas and Electric Company, the main spirit in which is Mr. John Martin. The officers of the Company are: President, John Martin; Vice-President, E. J. DeSabla, Jr.; Secretary, Henry Malloch; Superintendent, M. C. Osborne.

A SPECIAL meeting of the shareholders in the Marysville Gas and Electric Company is called for the morning of May 8th, at which meeting they will be asked to vote on a proposition creating a mortgage indebtedness of $100,000, to run for 30 years and to bear interest at the rate of 6 per cent. per annum. The Company, through Secretary Malloch, has issued a notice declaring that the following rates for gas and electric service shall prevail, until further notice: Gas for fuel purposes, $2 per 1,000; gas for illumination, $2.50 per 1,000; minimum charge for gas, meter and gas service, 25 cents per month. The electric current division of the schedule runs like this: 16 candle power lights, in stores, each per month; 1 or 2, 70 cents; 3 to 5, 65 cents; 6 and over, 60 cents; in residences, per month, 1, 2 or 3, $1; 4, $1.30; 5, $1.50; 6, $1.75; 7, $2; 8, $2 25; 9 or 10, $2.50; and 25 cents per month for each additional light. Eight candle power lights are to be charged for at two-third rates on the 16-candle power basis, and the minimum bill for residence illumination account is to be $1. Electric current by meter measurement is to be billed at 10 cents per 1,000 watts. Arc lights on commercial account are to cost $2 per week, and the rates for fan motor service, and for other motor service, are also set forth.

THE Pintsch Compressing Company, of Jersey City, N. J., capitalized in $500,000, has been granted a permit to do business in the State of Texas.

THE Perth Amboy (N. J.) Gas Company has arranged for important betterments to its purifying and condensing plants. The increased output at this point is a good tribute to the sagacity of Senator Kean and his associates.

A CORRESPONDENT incloses the following: "The first annual report to the town of Westfield, Mass., respecting its venture in owning and operating the gas and electric lighting plants, will prove interesting reading for the taxpayers, even though it does go to show that 'dollar gas' for Westfield is hardly to be expected this generation. The plants came into possession of the town June 1st, 1899, and the report covers a period of seven months, to January 1, 1900 There was paid for the plant $147,500, of which $124,500 was raised from the sale of bonds and $23,000 was taken from the amount received from the State on account of railroad grade crossing expenses. Of the $147,500 the gas plant was figured at $100,000, and the electric lighting plant at $47,500, the real estate of both inventorying $47,500, leaving $100,000 for machinery, mains, meters, etc. Since June 2, 881 feet of 3 inch pipe has been laid, and 30 houses and offices connected with the gas mains. This added 47 new customers to the previous list of 650 consumers. From the sales of gas and electric currents $22,023 was realized, and the expenditures were $17,711. The gross profit was $10,274, but the payment of interest on the bonds reduced the net profit to $5,463, or about 4 per cent. on the sum invested. The output of gas was 8,595,800 cubic feet, and the unaccounted-for gas amounted to nearly 9 per cent. As shown by the report of the State Inspector of Gas Meters and Illuminating Gas (Mr. Chas. D. Jenkins), the average candle power of the gas (three inspections) was 19.33."

THE shareholders of the Laclede Gas Light Company, of St. Louis, Mo., have agreed to the proposed issue of 10,000 shares of common stock, the proceeds of the sale to be devoted to enlarging the manufacturing and distributing plant. This issue will bring the common stock to $8,500,000.

THE Berlin Iron Bridge Company, of East Berlin, Conn., opened an office last Thursday in Philadelphia, in rooms 909 and 910, Stephen Girard Building. The office will be in charge of Mr. L. H. Brumbaugh, who has been with the Bridge Company a number of years.

THE stockholders of the Consumers Gas Company, of Newburgh, N. Y., will hold a special meeting this afternoon to accept or reject a proposition to sell and convey the property, rights and furnishings of the Company to the Consolidated Gas, Electric Light, Heat and Power Company, a domestic corporation engaged in a business of the same general nature. The sale and conveyance will vest the rights, property and furnishings, if transferred, to the Consolidated Gas, Electric Light

and Power Company for the term of its corporate existence. It will be recalled that the Electric Light Company voted some time ago to increase its capital and bonded indebtedness for the purpose of combining with the Gas Company.

EARLY this month a coronor's jury in Pittsburg, Pa., after considering the deaths of Morris Spidle and Myrtle Thompson, who died from gas poisoning, returned a verdict in accordance with the fact, and made a recommendation that the legislature enact a law prohibiting the manufacture and sale of gas heating stoves intended for use without flue connections. The victims had retired for the night in a room heated by a gas stove not connected to the house flues.

AT the annual meeting of the Wilmington (Del.) Coal Gas Company the Directors elected were: Washington Jones, Edward Betts, Jacob Derickson, George S. Capelle, Thomas Jackson, Edward Bringhurst, Jr., Samuel Bancroft, Jr., Alfred D. Poole and Henry C. Jones.

THE proprietors of the Peoples' Light and Power Company of Davenport, Iowa, have awarded a contract for the construction and installation of their new gas plant to the Western Gas Construction Company, of Fort Wayne, Ind. The plant will be erected on the site of of the old Paige & Dixon sawmill, just west of Mill street, below Second street. A dual plant will be installed up to the production of 250,000 cubic feet of coal gas and 250,000 cubic feet of water gas per day, and the buildings will be so constructed as to admit of duplicating at any time the apparatus requisite to double the output above named.

THE New York Assembly has passed the Senate bill (known as the Elsberg bill) under which the inspection of gas meters in New York city is to be performed by the State Inspector of Gas Meters.

A BILL putting the price of gas in Annapolis, Md., at $1.50 per 1,000 cubic feet, is before the Maryland Legislature. Its sponsor is Delegate Feldmyer, of Annapolis.

AT a meeting of the Directors of the Ogden Gas Company, of Chicago, held the 8th inst., it was voted to increase the capital stock from $5,000,000 to $10,000,000, and a special meeting of the shareholders, to accept or reject the proposition, was called for April 9th. Some are inclined to think this is the first step towards open warfare between the Peoples and the Ogden Companies; but others who should be thoroughly conversant with the situation declare that both concerns will have reached an amicable agreement before the new stock in the Ogden is issued.

AT the general election in Delaware, Ohio, to be held the 2d prox., the voters are to pass on the question of "Authorizing the Delaware Natural Gas Company, its successors or assigns, to go into operation in the city of Delaware for the purpose of selling and distributing gas for illuminating and lighting purposes as well as for heating and fuel purposes."

MR. FREDERICK A. STEARNS has been elected Clerk of the Waltham (Mass.) Gas Light Company, but the Board has not yet named a Treasurer and General Manager. Considerable friction has developed in regard to the selection of persons for the unfilled posts.

THE capital of the Owosso (Mich.) Gas Light Company has been increased from $36,000 to $48,000.

AT the annual meeting of the shareholders in the Providence (R. I.) Gas Company the report of the Company's operations for the year contained many interesting statements. According to the facts submitted, the quantity of "gas distributed during the year 1899 was 707,645,000 cubic feet. This is an increase of 56,000,000 cubic feet over the year 1898, or an increase for the past calendar year of 8 59 per cent. in consumption. Increased facilities were given to consumers in several ways. In 1899, 57,123 feet of gas main was laid. This makes a total of 262 miles of pipe now in use. The number of meters in use January 1, 1900, was 26,351, an increase during the year of 2,040. In other ways the service has been improved: 7,743 feet of 20 inch pipe, the largest size of main employed here, were laid from the Crary street holder to Elmwood avenue. This greatly helps out the supply of gas in the western and southern portion of the city insuring a better and steadier pressure and supply. The retort house on Allen's avenue (the South Station) has been rebuilt, with new foundations. A new purifying house has also been put in at the South Station. The connections to this will be made and the purifiers put in use this season. Another change has been the rebuilding of the old holder on Federal street. The building has been raised to twice its previous height, and a new double section holder, in place of the single-section, is nearly complete. This will insure a more plentiful supply to the section of the city supplied from this base." The reports also mention the laying of a new 16-inch pipe across the Seekonk river, at India street to East Providence. A full description of this work will be found elsewhere in this issue of the JOURNAL. Appropriate mention was made of the loss sustained by the Company in the death during the year of Mr. Lucian Sharpe and Mr. Jesse Metcalf, who had served the Company for many years as Directors.

THE contract for the public lighting of Shelton, Conn., by means of arc lamps, has been awarded by the authorities to the Derby Gas Company for a period of 10 years. The terms are practically those that ruled under the prior agreement.

THE authorities of Vallejo, Cal., have decided that the maximum rate "that may be charged by any person or corporation furnishing electric light to the citizens of Vallejo shall be 20 cents for 1,000 watts, meter rates. Provided, that 50 cents per month shall be a minimum charge for lighting any one place."

THE official announcement has been made that, on and after April 1st, the Essex and Hudson Gas Company, of Newark, N. J., will reduce its selling rate to $1 per 1,000 cubic feet, net. The concession, outside of Newark proper, applies to the Oranges, East Newark, Arlington, Kearney, Harrison, Irvington, Belleville, Caldwell, Bloomfield, Glen Ridge, Chestnut Hill and Montclair.

## The Jasper Mantle.[1]

Reports of trials made with this mantle, which is produced at a chemical works at Bernau, in Bavaria, indicate that it is far stronger and tougher than ordinary incandescent gas mantles, while its photogenic duty appears to be as high. The trials to which we allude were made in the presence of Dr. H. Lux, Editor of the "Zeitschrift fur Beleuchtungswesen," and of a representative of "Der Metallarbeiter," and they are described in recent numbers of those journals.

In the first instance, an English "Hill" Welsbach mantle was submitted to shocks on a specially devised stand, which was raised to a height of 0.4 inch, and then allowed to drop freely. The burner, on which the mantle was supported by the usual magnesia prop, was mounted upon a heavy cast iron upright attached to the stand. The stand was raised and dropped about 50 times per minute, so that a large number of violent shocks could be rapidly conveyed to the mantle under trial. The Welsbach mantle split just below the loop attachment, as soon as it had suffered three shocks on the stand. A Jasper mantle was then placed on the burner in its stead; and the stand was raised and dropped 150 times. The mantle was several times jolted right off its supporting prop by the severity of the jars, and then fell on the indented edge of the gallery of the burner. Its bottom edge was slightly torn thereby; but otherwise the mantle appeared uninjured by the falls sustained. It was next put on a second stand, and submitted to 100 shocks of rather less severity. As these had no appreciable effect on it, it was removed from its prop, and stood on its lower edge within the chimney on the stand, which was then raised and dropped some 25 times. The lower edge was thereby broken away for about $\frac{1}{16}$ inch. The mantle was afterwards placed on its top and on its side, and similarly submitted to a number of shocks.

At the conclusion of this severe trial, it was found that the only material injury suffered by it was that the mesh was torn in one spot near the base of the mantle, for a length of about $\frac{1}{2}$ inch. After these extraordinarily severe tests, the mantle was mounted on the burner; and observations were made on the photometer of the light afforded by it. It was found that, for a mean consumption of about 3.7 cubic feet per hour under a gas pressure of 14 tenths, the light was equal to 95.4 Hefner units, or 83.7 English candles. Clearly, therefore, the mantle afforded at least as high a photogenic duty as an ordinary mantle, which would not have withstood comparatively slight vibration.

The Jasper mantle on which these tests were made was drawn from stock by the Press representatives, and was incinerated and lighted in their presence before the trials. It was therefore not a specially prepared mantle. Tests of the durability of the mantle, and of the light afforded after many hours' use, are being conducted at the Physical-Technical Institute at Charlottenburg; and we hope to be able later to give the results.

1. *Journal of Gas Lighting.*

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 32 Pine Street, New York.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.
PACIFIC COAST GAS ASSOCIATION.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 Cents.

*Notification Respecting Advertising.*—Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co. 39 and 41 Chambers St.
*Germany*—Lemcke & Buechner, of New York.
*England*—Aug. Siegle, 30 Lime Street, London.

MONDAY, MAR. 19, 1900.

## The Market for Gas Securities.

Quotations in city gas shares for the week show no particular change, although dealings were on a fairly large scale. The certificate of the Consolidated Gas Company, respecting the increase in its capital stock to $54,595,200, has been filed, and the whole lot is now ready to be dealt in. The quotation for Consolidated to-day (Friday) at the close was 177 to 179, but the trading was next to nothing. Amsterdams, common and preferred, were remarkably strong, and the strength was attributed to buying for account connected with the Consolidated. Standards were nominal merely. There is nothing particularly new in the situation, nor will there be until the Legislature adjourns, which happy fact will likely be not until April 6th.

Brooklyn Union is steady, at about 145, when it should be selling very much higher. Peoples, of Chicago, is strong, and Baltimore Consolidated shows a disposition to recover some of its recent losses. Treasurer Lewis Lillie, of the United Gas Improvement Company, announces a quarterly dividend by it of 2 per cent., payable the 14th prox. Lacledes are steady. The proposition to increase its common stock in the sum of $1,000,000 has been indorsed.

## Gas Stocks.

**Quotations by George W. Close, Broker and Dealer in Gas Stocks.**

16 WALL STREET, NEW YORK CITY.

MARCH 19.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

| *N. Y. City Companies.* | *Capital.* | *Par.* | *Bid.* | *Asked.* |
|---|---|---|---|---|
| Consolidated | $54,595,200 | 100 | 177 | 179 |
| Central Union, Bonds, 5's. | 3,000,000 | 1,000 | 103½ | 105 |
| Equitable Bonds, 6's | 1,000,000 | 1,000 | 105 | .. |
| " 1st Con. 5's | 2,300,000 | 1,000 | 115 | 118 |
| Metropolitan Bonds | 658,000 | .. | 108 | 112 |
| Mutual | 3,500,000 | 100 | 275 | 300 |
| " Bonds | 1,500,000 | 1,000 | 100 | 102 |
| Municipal Bonds | 750,000 | . | .. | |
| New Amsterdam Gas Co. | 13,000,000 | 100 | 27 | 27½ |
| Preferred | 10,000,000 | 100 | 49 | 50 |
| Bonds, 5's | 11,000,000 | 1,000 | 97 | 97½ |
| Northern Union, Bonds, 5's. | 1,250,000 | 1,000 | 95 | 97 |
| New York and East River.. | | | | |
| Bonds 1st 5's | 3,500,000 | 1,000 | 109 | 111 |
| " 1st Con. 5's | 1,500,000 | .. | 115 | .. |
| Richmond Co., S. I. | 348,650 | 50 | 70 | .. |
| " Bonds | 100,000 | 1,000 | .. | .. |
| Standard | 5,000,000 | 100 | 100 | 117 |
| Preferred | 5,000,000 | 100 | 138 | 145 |
| Bonds, 1st Mortgage, 5's | 1,500,000 | 1,000 | 110 | 114 |
| Yonkers | 299,65 | 500 | 130 | .. |
| *Out-of-Town Companies.* | | | | |
| Brooklyn Union | 15,000,000 | 100 | 144½ | 146 |
| " " Bonds (5's) | 15 000,000 | 1,000 | 118 | 119 |
| Bay State | 50,000,000 | 50 | 1½ | 1⅝ |
| " Income Bonds | 2,000,000 | 1,000 | .. | 75 |
| Binghamton Gas Works | 450,000 | 100 | 40 | .. |
| " 1st Mtg. 5's | 475,000 | 1,000 | 96½ | 99½ |
| Boston United Gas Co.— | | | | |
| 1s Series S. F. Trust | 7,000,000 | 1,000 | 77½ | 79 |
| 2d " " " | 3,000,000 | 1,000 | 68 | .. |
| Buffalo City Gas Co. | 5,500,000 | 100 | 5 | 8 |
| " " Bonds, 5's | 5,250,000 | 1,000 | 69 | 71 |
| Central, San Francisco | 2,000,000 | .. | 106 | 108 |
| Chicago Gas Co. Guaranteed Gold Bonds | 7,650,000 | 1,000 | 104 | 104¼ |
| Columbus (O.) Gas Co., 1st Mortgage Bonds | 1,207,000 | 1,000 | | 108 |
| Columbus (O.) Gas Lt. & Heating Co | 1,682,750 | 100 | 60 | 65 |
| Preferred | 3,026,500 | 100 | 84 | 86 |
| Consumers, Jersey City Bonds | 600,090 | 1,000 | 102 | 105 |
| Cincinnati G. & C. Co. | 8,500,000 | 100 | 196 | 197 |
| Consumers, Toronto | 1,700,000 | 50 | 230 | 235 |
| Capital, Sacramento | 500,000 | 50 | .. | 35 |
| Bonds (6's) | 150,000 | 1,000 | .. | .. |
| Consolidated, Baltimore | 11,000,000 | 100 | 55½ | 55¾ |
| Mortgage, 6's | 3,600,000 | .. | .. | 118 |
| Chesapeake, 1st 6's. | 1,000,000 | .. | .. | .. |
| Equitable, 1st 6's. | 910,000 | .. | .. | .. |
| Consolidated, 1st 5's | 1,490 000 | .. | .. | 112 |
| Consolidated Gas Co. of N.J. | 1,000,000 | 100 | 21 | 23 |
| " Con. Mtg. 5's | 880,000 | 1,000 | 87 | 90 |
| Consolidated G. & E. Co.'s., Little Falls, N.Y. | 90,000 | 100 | .. | 100 |
| Bonds | 75,000 | .. | .. | 100 |
| Detroit City Gas Co. | 4,560,000 | 50 | 95¾ | 96 |
| " Prior Lien 5's | 4,598,000 | 1,000 | 99½ | 100 |
| Detroit Gas Co., 5's | 386,000 | 1,000 | 100 | 101 |
| " Inc. 5's | 16,000 | 100 | 100½ | 101 |
| Equitable Gas & Fuel Co., Chicago, Bonds | 2,000,000 | 1,000 | .. | 101 |
| Fort Wayne | 2,000,000 | .. | 35 | 41 |
| " Bonds | 2,000,000 | .. | 60 | 64 |
| Grand Rapids Gas Lt. Co. | 1,000,000 | 50 | .. | .. |
| " 1st Mtg. 5's | 1,125,000 | 1,000 | .. | .. |
| Hartford | 750,000 | 25 | .. | 220 |
| Hudson County Gas Co., of New Jersey | 10,500,000 | .. | 25 | .. |
| " Bonds, 5's | 10,500,000 | .. | 102 | 105 |
| Indianapolis | 2,000,000 | .. | 100 | 105 |
| " Bonds, 6's | 2 650,000 | .. | 101 | 103 |
| Jackson Gas Co | 250,000 | 50 | 72 | 78 |
| " 1st Mtg. 5's | 250,000 | 1,000 | 101 | 102½ |
| Lafayette Gas Co., Ind. | 1,000,000 | 100 | 40 | 45 |
| Bonds | 1,000,000 | 1,000 | 60 | 65 |
| Louisville | 2,570,000 | 50 | 106 | |
| Laclede, St. Louis | 7,500,000 | 100 | 77½ | 78 |
| Preferred | 2,500,000 | 100 | .. | 101 |
| Bonds | 10,000,000 | 1,000 | 110 | 110½ |
| Madison Gas & Elec. Co. | 400,000 | 100 | 82 | .. |
| " 1st Mtg. 6's | 350,000 | 1,000 | 102½ | 108 |
| Montreal, Canada | 2,000,000 | 100 | 200 | .. |
| Newark, N. J., Gas Co. | 16,000,000 | .. | 50 | 60 |
| Bonds, 6's | 4,600,000 | .. | 107 | 108 |
| New Haven | 1,000,000 | 25 | 280 | 300 |
| Nashville Gas Lt. Co. | 1,000,000 | 50 | 110 | .. |
| Oakland, Cal. | 2,000,000 | .. | 43 | 45 |
| " Bonds | 750,000 | .. | .. | .. |
| Peoples G. L. & Coke Co., of Chicago | 25,000,000 | 100 | 97¼ | 97¾ |
| Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage | 20,100,000 | 1,000 | 111⅜ | 111½x |
| 2d " | 2,500,000 | 1,000 | 104 | 105 |
| Rochester Gas & Elec. Co. | 2,150,000 | 50 | 88 | .. |
| Preferred | 2,150,000 | 50 | 118 | .. |
| Consolidated 5's | 2,000,000 | .. | 87¼ | 90 |
| San Francisco, Cal. | 10,000,000 | 100 | 54 | 54½ |
| St. Paul Gas Light Co. | 1,500,000 | 100 | 57¼ | 58½ |
| 1st Mortgage 6's. | 650,000 | 1,000 | 82 | 85 |
| Extension, 6's. | 600,000 | 1,000 | .. | .. |
| General Mortgage, 5's. | 2,428,000 | 1,000 | 88 | 90½ |
| St. Joseph Gas Co. | 1,000,000 | 100 | 42 | 44 |
| " 1st Mtg. 5's. | 750,000 | 1,000 | 96½ | 98 |
| Syracuse, N. Y. | 1,750,000 | 100 | .. | 15 |
| Bonds. | 1,612 000 | 1,000 | 85 | 90 |
| Washington, D. C | 2,600,000 | 20 | 271⅞ | 272½ |
| First mortgage 6's. | 600,000 | .. | .. | .. |
| Western, Milwaukee | 4,000,000 | 100 | 106¾ | 107¾ |
| Bonds, 5's | 3,830,500 | . | 106 | 108 |
| Wilmington, Del. | 600,000 | | 220 | 50 |

## Advertisers' Index.


### GAS ENGINEERS.

| | Page |
|---|---|
| Wm. Henry White, New York City | 475 |
| Fred. Bredel, Milwaukee, Wis. | 462 |
| Geo. R. Rowland, New York City | 473 |
| The Western Gas Construction Co., Fort Wayne, Ind. | 440 |
| Humphreys & Glasgow, New York City | 473 |
| American Gas Co., Phila., Pa. | 462 |
| David Leavitt Hough, New York City | 472 |
| Economical Gas Apparatus Construct'n Co., Toronto, Ont. | 459 |
| Baxter & Young, Detroit, Mich | 472 |
| United Gas Improvement Co., Phila., Pa | 467 |
| James T. Lynn, Detroit, Mich | 472 |
| A. E. Boardman, Brevard, N. C | 472 |

### GAS WORKS APPARATUS AND CONSTRUCTION.

| | |
|---|---|
| James R. Floyd's Sons, New York City | 476 |
| Continental Iron Works, Brooklyn, N. Y. | 474 |
| Deily & Fowler, Phila., Pa | 476 |
| Kerr Murray Mfg. Co., Fort Wayne, Ind | 472 |
| Stacey Mfg. Co., Cincinnati, Ohio | 475 |
| Bartlett, Hayward & Co., Baltimore, Md. | 473 |
| Davis and Farnum Mfg. Co., Waltham, Mass. | 472 |
| R. D. Wood & Co., Phila., Pa. | 474 |
| Isbell-Porter Company, New York City | 474 |
| Fred. Bredel, Milwaukee, Wis. | 462 |
| United Gas Improvement Co., Phila., Pa. | 467 |
| National Gas and Water Co., Chicago, Ills. | 469 |
| Economical Gas Apparatus Construct'n Co., Toronto, Ont. | 459 |
| The Western Gas Construction Co., Fort Wayne, Ind. | 440 |
| Humphreys & Glasgow, New York City | 473 |
| American Gas Co., Phila., Pa. | 462 |
| Logan Iron Works, Brooklyn, N. Y. | 476 |
| Riter-Conley Mfg. Co., Pittsburgh, Pa. | 475 |
| Baxter & Young, Detroit, Mich. | 472 |
| Berlin Iron Bridge Co., East Berlin, Conn | 461 |
| G. Shepard Page's Sons, New York City | 472 |
| James T. Lynn, Detroit, Mich. | 472 |
| A. E. Boardman, Brevard, N. C. | 472 |
| Sutherland Construction & Improvement Co., N.Y. City | 460 |
| Chris. Cunningham & Son, Brooklyn, N.Y. | 460 |

### PROCESSES.

| | |
|---|---|
| Bartlett, Hayward & Co., Baltimore, Md. | 473 |
| United Gas Improvement Co., Phila., Pa. | 467 |
| Burdett Loomis, Hartford, Conn. | 474 |
| National Gas and Water Co., Chicago, Ills. | 469 |
| Economical Gas Apparatus Construct'n Co., Toronto, Ont. | 459 |
| The Western Gas Construction Co., Fort Wayne, Ind. | 440 |
| Humphreys & Glasgow, New York City | 473 |
| Sutherland Construction & Improvement Co., N.Y. City | 460 |
| B. E. Chollar, St. Louis, Mo | 464 |

### SCRUBBERS AND CONDENSERS.

| | |
|---|---|
| R. D. Wood & Co., Phila., Pa. | 474 |
| James R. Floyd's Sons, New York City | 476 |
| Continental Iron Works, Brooklyn, N. Y. | 474 |
| Logan Iron Works, Brooklyn, N. Y. | 476 |
| Riter-Conley Mfg. Co., Pittsburgh, Pa. | 475 |

### TAR AND CARBONIC ACID EXTRACTOR.

| | |
|---|---|
| R. D. Wood & Co., Phila., Pa. | 474 |

### AMMONIA CONCENTRATORS.

| | |
|---|---|
| Michigan Ammonia Works, Detroit, Mich. | 465 |
| American Gas Company, Phila., Pa. | 462 |

### GAS METERS.

| | |
|---|---|
| John J. Griffin & Co., Phila., Pa. | 480 |
| American Meter Co., New York and Philadelphia | 479 |
| Helme & McIlhenny, Phila., Pa. | 479 |
| D. McDonald & Co., Albany, N.Y. | 477 |
| Nathaniel Tufts Meter Co., Boston, Mass. | 478 |
| Maryland Meter and Mfg. Co., Baltimore, Md. | 478 |
| Metric Metal Co., Erie, Pa | 479 |
| Keystone Meter Co., Royersford, Pa. | 478 |
| Detroit Meter Company, Detroit, Mich. | 479 |

### PREPAYMENT METERS.

| | |
|---|---|
| American Meter Co., New York and Philadelphia | 479 |
| John J. Griffin & Co., Phila., Pa. | 480 |
| D. McDonald & Co., Albany, N.Y. | 477 |
| Helme & McIlhenny, Phila., Pa. | 479 |
| Nathaniel Tufts Meter Co., Boston, Mass. | 478 |

### GAS AND WATER PIPES.

M. S. Drummond & Co., New York City ..... 477
R. D. Wood & Co., Phila., Pa. ..... 474
Warren Foundry and Machine Co., New York City ..... 477
Donaldson Iron Co., Emaus, Pa. ..... 477
Chris. Cunningham & Son, Brooklyn, N.Y. ..... 460
Cornell & Underhill, New York City ..... 455

### PIPE CUTTERS.

The Anderson Pipe Cutter Co., East Boston, Mass. ..... 456

### GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., N. Y. City ..... 459

### GAS TAPPING MACHINES.

George Light, Dayton, O. ..... 455

### STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, Brooklyn, N. Y. ..... 469

### GAS COALS.

Penn Gas Coal Co., Phila., Pa. ..... 471
Perkins & Co., New York City ..... 470
Despard Gas Coal Co., Baltimore, Md. ..... 471
Westmoreland Coal Co., Phila., Pa. ..... 471
Berwind-White Coal Mining Co., New York and Phila. ... 470

### CANNEL COALS.

Perkins & Co., New York City ..... 470

### CONVEYORS.

The Link-Belt Machinery Co., Chicago, Ills. ..... 469

### GAS ENRICHERS.

Standard Oil Co., New York City ..... 471
The Sun Oil Co., Pittsburgh, Pa. ..... 471

### COKE CRUSHER.

C. M. Keller, Columbus, Ind. ..... 471

### GAS GAUGES.

The Bristol Co., Waterbury, Conn. ..... 461

### GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 479
Isbell-Porter Co., New York City ..... 474
R. D. Wood & Co., Phila., Pa. ..... 474
Wm. M. Crane Co., New York City ..... 458

### CEMENTS.

C. L. Gerould, Galesburg, Ills ..... 468

### RETORTS AND FIREBRICKS.

J. H. Gautier & Co., Jersey City, N. J. ..... 468
Adam Weber, New York City ..... 468
Laclede Firebrick Mfg. Co., St. Louis, Mo. ..... 468
Cyrus Borgner, Phila., Pa. ..... 468
James Gardner, Jr., Pittsburgh, Pa. ..... 468
Henry Maurer & Son, New York City ..... 468
Baltimore Retort and Firebrick Co., Baltimore, Md. ..... 468
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. ..... 468
Brooklyn Firebrick Works, Brooklyn, N. Y. ..... 468

### REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md. ..... 473
Fred. Bredel, Milwaukee, Wis. ..... 462
J. H. Gautier & Co., Jersey City, N. J. ..... 468
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. ..... 468
Adam Weber, New York City ..... 468

### SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Co., New York City ..... 474
Continental Iron Works, Brooklyn, N.Y. ..... 474
Logan Iron Works, Brooklyn, N. Y. ..... 476
R. D. Wood & Co., Phila., Pa. ..... 474

### INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa. ..... 466

### BURNERS.

C. A. Gefrorer, Phila., Pa. ..... 474
Wm. M. Crane Co., New York City ..... 479
D. M. Steward Mfg. Co., Chattanooga, Tenn. ..... 459

### LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn. ..... 459

### STREET LAMPS.

Welsbach Street Lighting Co., New York and Phila. ..... 464
Thos. T. W. Miner, New York City ..... 456

### PURIFIERS.

Stacey Mfg. Co., Cincinnati, O. ..... 464

### PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 469

### VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y. ..... 461
Chapman Valve Manufacturing Co., Boston, Mass. ..... 461
R. D. Wood & Co., Phila., Pa. ..... 474
Continental Iron Works, Brooklyn, N. Y. ..... 474
The P. H. & F. M. Roots Co., Connersville, Ind. ..... 468
Isbell-Porter Co., New York City ..... 474
The Western Gas Construction Co., Fort Wayne Ind. ... 440

### EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind. ..... 468
Isbell-Porter Company, New York City ..... 474
Connelly Iron Sponge and Governor Co., New York City 469

### ELECTRICAL APPARATUS.

Wm. Henry White, New York City ..... 475

### ENGINES AND BOILERS.

The Hazelton Boiler Company, New York City ..... 456

### PURIFIER SCREENS.

John Cabot, New York City ..... 461

### GAS STOVES.

American Meter Co., New York and Philadelphia ..... 465
Maryland Meter and Manufacturing Co., Baltimore, Md. 478
Keystone Meter Co., Royersford, Pa. ..... 478
Wm. M. Crane Co., New York City ..... 458
Nathaniel Tufts Meter Co., Boston Mass. ..... 478
National Stoves, Lorain, O. ..... 456
Abendroth Brothers, Port Chester, N. Y. ..... 456
Detroit Stove Works, Detroit, Mich ..... 457

### HOT WATER HEATERS.

Wm. M. Crane Co., New York City ..... 458

### GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N. Y. ..... 473

### GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md. ..... 473
Continental Iron Works, Brooklyn, N. Y. ..... 474
Deily & Fowler, Philadelphia, Pa. ..... 476
Davis & Farnum Mfg. Co., Waltham, Mass. ..... 472
Kerr Murray Mfg. Co., Fort Wayne, Ind. ..... 472
Stacey Mfg. Co., Cincinnati, Ohio ..... 475
R. D. Wood & Co., Philadelphia, Pa. ..... 474
Logan Iron Works, Brooklyn, N. Y. ..... 476
Riter-Conley Mfg. Co., Pittsburgh, Pa. ..... 475
Chris. Cunningham & Son, Brooklyn, N.Y. ..... 460

### GAS SECURITIES.

Henry Marquand & Co., New York City ..... 426

### ADVERTISING.

J. Howland Harding, New York City ..... 486

### BOOKS, ETC.

Newbigging's Handbook ..... 424
Field's Analysis, 1898 ..... 221
Scientific Books ..... 470
Digest of Gas Cases ..... 471
Practical Photometry ..... 468
Gas Flow Computers ..... 478
Hughes' "Gas Works" ..... 469
Gas Engineer's Pocket-Book ..... 424
Excerpts from Reports of Gas Commissioners ..... 479
Binders ..... 477
Directory of Gas Companies ..... 475
Practical Handbook on Gas Engines ..... 344
Coal Tar Tree ..... 460

## DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILA., PA., Mar. 14, 1900.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable April 14, 1900, to stockholders of record at the close of business March 31. Checks will be mailed.

1293 4 LEWIS LILLIE, Treasurer.

## Position Wanted

**As Manager or Engineer of a Gas Company.**

Thoroughly Competent Gas Manager of many years' experience in the manufacturing and the executive ends of a Gas Company desires a position as Manager or Engineer of a Gas Company selling not less than 50,000,000 cubic feet per annum. Highest references given. Address "T.,"

1267-tf Care this Journal.

## WANTED,

**Operator for Improved Lowe Water Gas Apparatus.**

A good, reliable man, perfectly sober, as operator for Improved Lowe Water Gas Apparatus of 300,000 cubic feet capacity. Send application to

SUPERINTENDENT FORT WAYNE GAS CO.,
1292-3 Fort Wayne, Ind.

## WANTED,

PURIFIERS.

Two second-hand purifiers in good condition, not less than 8 x 10 or larger than 12 x 14 feet, and not less than 8 feet deep. Address "KNOX,"

1292-4 Care this Journal.

## WANTED,

**CANVASSER FOR GAS STOVES,**

Western town. Apply, stating wages required on a six months' contract.

1252-tf Address "G.," care this Journal.

## Gas Meters for Sale.

We have for sale good second-hand gas meters, 3 lights, $2.50; 5 lights, $3; larger sizes in proportion.

THE COLUMBUS GAS COMPANY,
1291 tf Columbus, O.

## Backus Gas Heaters at ¼ Cost Price!

We have for sale, at one-fourth cost price, a lot of Backus Gas Heaters. Most of them have never been used. Write for list and particulars.

**THE COLUMBUS GAS COMPANY,**
1238-tf COLUMBUS, O.

## MRS. ALICE CAREY WATERMAN,

**Demonstration Lectures**

In the Delightful Art of Cookery. For Gas Companies a Specialty. Chicago Address,

1292-2 1913 DEMING PLACE.

## NOW READY!

*Reference Book of American Gas and Electric Light Securities. 1900 Edition.*—This publication, just issued, will supply a long felt want for *Bankers*, Brokers, Investors and all who are interested directly or indirectly in gas or electric light companies. It contains full and accurate information regarding practically all the leading lighting companies of America. Price per copy, $2.

**O. C. LEWIS & CO., Publishers,**
10 Wall Street, New York City.

## CORNELL & UNDERHILL,

## Wrought & Cast Iron Pipe,

**MALLEABLE AND CAST IRON FITTINGS,**

Brass and Iron Cocks and Gate Valves,

**13 GOLD STREET, NEW YORK.**

## GAS TAPPING MACHINES

—FOR—

**Drilling and Tapping Pipe under Pressure**

**WITHOUT ANY ESCAPE OF GAS.**

**They are Strong and Compact.**

**Size of Combination Drills and Taps ¾ to 4-inch.**

*Machines Sent to any Gas Company for Thirty Days' Trial.*

Send for Circulars.

**Geo. Light,**
**DAYTON, O.**

## For Sale.

**A Small Gas and Electric Light Plant,**

in a Southern city of 3,800 inhabitants.

Address FORT WAYNE ELECTRIC CORPORATION,

1097-tf Fort Wayne, Ind.

PLANS ADVICE WRITING ILLUSTRATING

**J. HOWLAND HARDING, ADVERTISING,**

1545 BROADWAY LONG ACRE SQUARE NEW YORK

## HENRY MARQUAND & CO.,

**BANKERS AND BROKERS.**

**160 Broadway, New York City.**

**Utilize Your Gas Liquor.**

NO EXTRA LABOR OR OPERATING EXPENSES.

**Ammonia Concentrator,**

Not Expensive. Write to

STROH & OSIUS, Pat'ees, or Mich. Ammonia Works, Detroit, Mich.

## REMOVAL NOTICE.

## The Hazelton Boiler Company

have removed to their NEW WORKS at Rutherford, New Jersey.

Please address all communications to the Company at their New Office, **120 Liberty Street, N. Y. City.**

## "THE MINER"

**Globe Street and Boulevard Lamps.**

**Cheapest and Best.**

THOUSANDS IN USE WITH INCANDESCENT BURNERS.

*Send for Catalogues.*

**THOMAS T. W. MINER,**

821-823 Eagle Av., N.Y.

**THE ANDERSON Patent Cutter Carrying Link**

Made in all sizes.

Will cut from 2 in. to 24 in.

**Pipe Cutting Tool**

For Cutting Cast, Wrought Iron, Gas & Water Pipes.

THE ANDERSON PIPE CUTTER COMPANY, Manufacturers,

163 Liverpool st., E. Boston, Mass

N. Y. Office, 135 Greenwich St.

C. H. TUCKER, Jr., Manager.

WALDO BROS., 102 Milk Street, Boston, Mass.

# DIRECT ACTION GAS RANGE

## Is the Most Economical Gas Consumer on the Market.

We can and will prove this to you if you desire. SEVEN FEET OF GAS will turn out a baking of biscuits well done. Write us, we can save you some trouble.

## "NATIONAL STOVES,"

LORAIN, OHIO.

# YORK GAS RANGE,

## Possessing Features Found in No Other.

## HIGH IN EFFICIENCY, HANDSOME IN DESIGN.

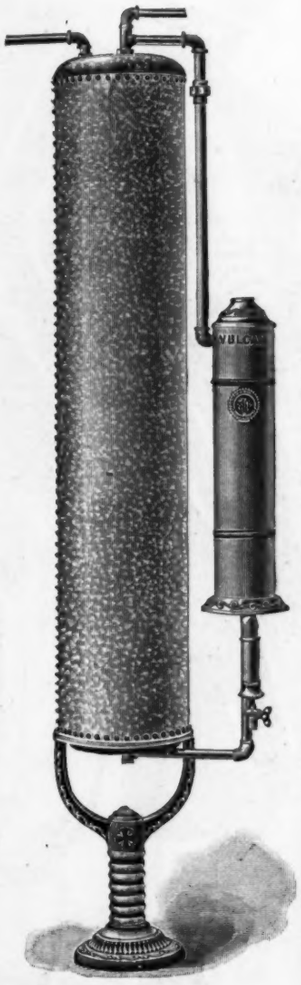
The construction of our oven for 1900 is entirely new, BEING QUICK and ECONOMICAL.

Our New Catalogue is now ready, if you have not received a copy, send us your name and address and we will be pleased to send you copy.

## ABENDROTH BROS.,

**109-111 Beekman St., New York City.** **Port Chester, N. Y.**

# New "Vulcan" Water Heater No. 7.




The **No. 7 "Vulcan" Water Heater** will heat the water in house boilers up to 40 gallons.

No better heater on the market for efficiency and economy of gas. Compactly made and easily attached to the boiler

The cold water inlet passes up through the center of the heater to the head, which is made of solid **brass** casting, from which the water is forced through twelve ½-inch tubes to the hot water outlet inside of brass casting direct to top of boiler.

A powerful burner using 35 feet per hour, with an adjustable air mixer, is furnished with each heater, and so placed that the space occupied is **vertical,** the mixing chamber not protruding at right angles to the boiler

Tubes can easily be cleaned and sediment removed—a plug being attached to each pair of tubes.

Heater is lined with asbestos to prevent loss of heat.

This heater can be used in connection with the water back on the coal range if desired.

**Complete line of Gas Appliances for Cooking, Heating, Lighting and Manufacturing Purposes.**

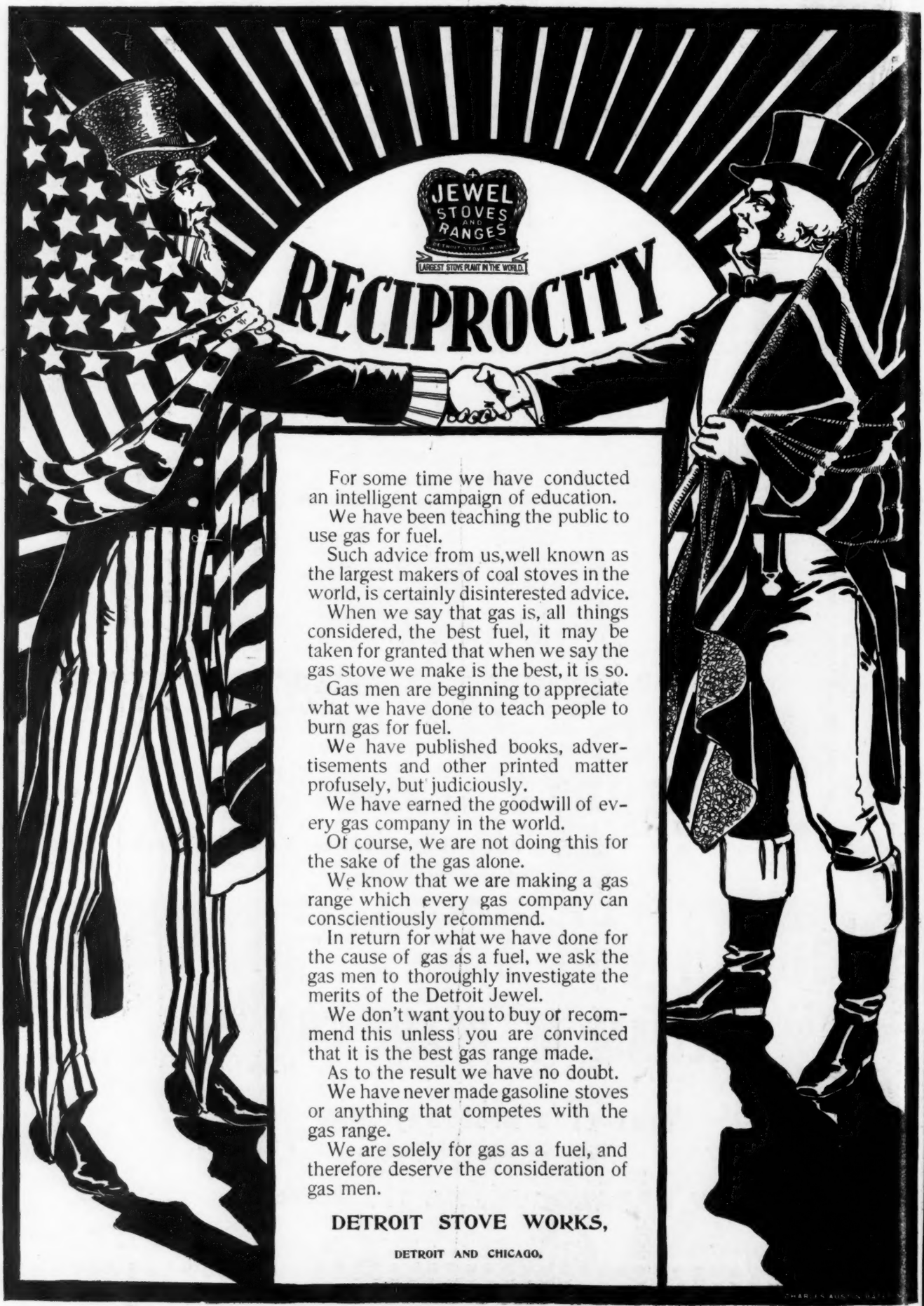
**Sole Agents in the United States for Bray Burners.**

## WILLIAM M. CRANE COMPANY,

**1131-1133 Broadway, New York.**

FOUNDRY, PEEKSKILL, N. Y.

**OUR NEW CATALOGUE, No. 17, Mailed on Application.**




For some time we have conducted an intelligent campaign of education.

We have been teaching the public to use gas for fuel.

Such advice from us, well known as the largest makers of coal stoves in the world, is certainly disinterested advice.

When we say that gas is, all things considered, the best fuel, it may be taken for granted that when we say the gas stove we make is the best, it is so.

Gas men are beginning to appreciate what we have done to teach people to burn gas for fuel.

We have published books, advertisements and other printed matter profusely, but judiciously.

We have earned the goodwill of every gas company in the world.

Of course, we are not doing this for the sake of the gas alone.

We know that we are making a gas range which every gas company can conscientiously recommend.

In return for what we have done for the cause of gas as a fuel, we ask the gas men to thoroughly investigate the merits of the Detroit Jewel.

We don't want you to buy or recommend this unless you are convinced that it is the best gas range made.

As to the result we have no doubt.

We have never made gasoline stoves or anything that competes with the gas range.

We are solely for gas as a fuel, and therefore deserve the consideration of gas men.

**DETROIT STOVE WORKS,**

DETROIT AND CHICAGO.

W. H. PEARSON, Prest. W. H. PEARSON, Jr., Vice-President J. T. WESTCOTT, M.E., Manager. L. L. MERRIFIELD, M.Inst.M.E., Chief Engineer.

# THE ECONOMICAL GAS APPARATUS CONSTRUCTION CO., LD.

**American Offices: 269 FRONT STREET, EAST, TORONTO, ONT.**
**London Offices: 19 ABINGDON STREET, WESTMINSTER, S.W.**

Telegraphic Address: "CARBURETED LONDON AND TORONTO."

**The above Company have erected since 1893, or are now erecting, their universal type of Carbureted Water Gas Plants at the following Gas Works:**

| | Cubic Feet Daily. |
|---|---|
| Blackburn, Eng. | 1,250,000 |
| Windsor Street Works, Birmingham, Eng. | 2,000,000 |
| Saltley Works, Birmingham, Eng. | 2,000,000 |
| Colchester, Eng. | 300,000 |
| Birkenhead, Eng. | 2,250,000 |
| Swindon (New Swindon Gas Co.), Eng. | 120,000 |
| Saltley Works, Birmingham, Eng. (2d Contract) | 2,000,000 |
| Windsor St. W'ks, Birming'm, Eng. (2d Contract) | 2,000,000 |
| Halifax, Eng. | 1,000,000 |
| Toronto, | 250,000 |
| Ottawa, | 250,000 |
| Toronto (Second Contract, Remodeled), | 2,000,000 |
| Lindsay (Remodeled), | 125,000 |
| Belleville, | 250,000 |
| Ottawa (Second Contract), | 250,000 |
| Brantford (Remodeled) | 200,000 |
| St. Catherine's (Remodeled), | 250,000 |
| Kingston, Pa. | 125,000 |
| Montreal, | 500,000 |
| Peterborough, Ont. | 250,000 |
| Wilkesbarre, Pa. | 750,000 |
| St. Catherine's (Second Contract), | 250,000 |
| Buffalo, N. Y. | 2,000,000 |
| Winnipeg, Man. | 500,000 |
| Colchester, Eng. (Second Contract), | 300,000 |
| York, Eng. | 750,000 |
| Rochester, Eng. | 500,000 |
| Kingston, Ont. | 300,000 |
| Crystal Palace District, Eng. | 2,000,000 |
| Duluth, Minn. | 300,000 |
| Caterham, Eng. | 150,000 |
| Enschede, Holland, | 150,000 |
| Leicester, Eng. | 2,000,000 |
| Buenos Ayres (River Platte Co.), | 700,000 |
| Burnley, Eng. | 1,500,000 |
| Kingston-on-Thames, Eng. | 1,750,000 |
| Accrington, Eng. | 500,000 |
| Tonbridge, Eng. | 300,000 |
| Stretford, Eng. | 500,000 |
| Oldbury, Eng. | 300,000 |

LET US GIVE YOU A

STEWARD'S BURNERS

GIVE YOU

**Best Results.**

**The D. M. Steward Mfg. Co.,**

New York Office, 107 CHAMBERS ST. CHATTANOOGA, Tenn.

# GAS COMPANIES

Should consider the advantage to be gained in forestalling criticism and avoiding complaint by furnishing for every cubic foot of gas consumed by their customers the fullest equivalent in lighting power.

BRAY BURNERS are made for high and low pressure. We invite the utmost test and comparison with all burners on the market.

**W. M. CRANE COMPANY,**

THE THOMAS DAY COMPANY, Distributing Agents for the Pacific Coast, SAN FRANCISCO, CAL.

Sole Agents for the United States, 1131 & 1133 Broadway, New York.

# SAFETY GAS MAIN STOPPER CO.

211-E. 116 TH ST. N.Y.

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS

# THE LINK-BELT MACHINERY CO.,

ENGINEERS, FOUNDERS, MACHINISTS,
Chicago, U. S. A.

"Link-Belt" Breaker.

**LINK-BELT** ELEVATING & CONVEYING MACHINERY for HANDLING COAL, COKE, OXIDE, ETC

Tilting Coal and Coke Cars,
Breaker Rolls, Shaking Screens,
Power Transmitting Machinery

Machinery designed and erected to suit existing conditions and available space.

CATALOGUE UPON APPLICATION.

# Sutherland Construction & Improvement Co.

**Offices: 15 WALL ST., NEW YORK, and OSHKOSH, WISCONSIN.**

Owners of the "SUTHERLAND" Patents for Water Gas Apparatus.

**Gas, Electric Light, Water Works, and Electric Street Railways Built, Remodeled, Operated, Bought and Sold.**

**A few of the places where the SUTHERLAND Apparatus is in successful operation:**

Ilion, N. Y.
Herkimer, N. Y., 2 orders.
Little Falls, N. Y.
Fishkill-on-Hudson, 2 orders.
Clifton Springs, N.Y., 2 orders.
Green Bay, Wis.
Stevens Point, Wis.
Tarrytown, N.Y., 3 orders.
Ft. Henry, N. Y.
Gainsville, Fla.
Hollidaysburg, Pa.
Waterville, N. Y.
Huntington, L. I.
Lexington, Mo.
Mendota, Ill.
Circleville, O.
Joplin, Mo.
Ashville, N. C.
Youngstown, O.
Kingston & Rondout, N. Y.

CORRESPONDENCE SOLICITED.

## CHRIS. CUNNINGHAM & SON,

PROPRIETORS,

# THE NOVELTY STEAM BOILER WORKS,

**BROOKLYN, N. Y.**

## STORAGE TANKS FOR GAS WORKS,

To Retain Fluid Material of Any Sort.

## PIPING IN AND AROUND GAS WORKS.

Work Done for Several of the Largest Gas Companies in America Stands as Reference.

## NOTICE.

We have in our yard, at East Berlin, Conn., a very large stock of beams, channels, angles, plates and other structural material of high quality. We are able to furnish from this stock any ordinary bridge, building, roof or other structural work promptly and with no delay. We invite correspondence.

## THE BERLIN IRON BRIDGE CO.,

**BOSTON OFFICE:**
Room 200,
Equitable Building.

**NEW YORK OFFICE:**
Room 718 Bennett Building,
Cor. Fulton and Nassau Sts.

**PHILADELPHIA OFFICE:**
Rooms 909-910 Stephen Girard Building.

**MAIN OFFICE AND WORKS:**
EAST BERLIN, CONN.

---

**PURIFIER and SCRUBBER**

**TRAYS**

OF ALL KINDS.

Send for Circulars.

## John Cabot,

553-557 West Thirty-third Street, New York.

---

## CHAPMAN VALVE MANUFACTURING CO.

MANUFACTURERS OF

**Valves and Gates for Gas, Ammonia, Water, Etc.**

**Also, Gate Fire Hydrants with and without Independent Nozzle Valve. All Work Guaranteed.**

Works & Gen'l Office, Indian Orchard, Mass. Treasurer's Office, 72 Kilby & 112 Milk Sts., Boston, Mass.
Chicago Office, 24 West Lake St. New York Office, 28 Platt St.
St. Louis Office, L. M. Rumsey Mfg. Co., 810 North Second St.

---

Bristol's Recording

**PRESSURE GAUGE.**

For continuous records of **Street Gas Pressure.** Simple in construction, accurate in operation, and low in price.

Fully Guaranteed. Send for Circulars.

## THE BRISTOL CO.,

Waterbury, Conn.

---

THE

## Ludlow Valve Mfg. Co.,

**TROY, N. Y., U. S. A.**

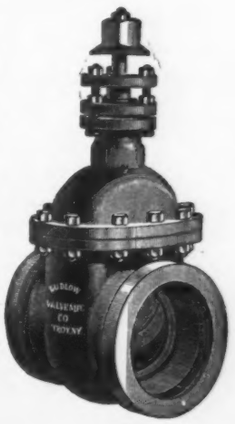
Double and Single Gate Valves, ¼" to 72",

—FOR—

**Gas, Water, Steam, Oil, Ammonia, Etc.**

**HOT GAS VALVES A SPECIALTY.**

Send for Catalogue.



# AMERICAN GAS COMPANY

## Constructors of Coal Gas Apparatus.

**BREDEL'S SYSTEM** Recuperative Furnaces, Washers, Condensers, Purifiers and Purifying Machines, Ammonia Plant, Coke Conveyers, Charging and Discharging Machines, Etc.

Complete Works Erected with Guaranteed Results.

EASTERN AGENTS FOR

**BREDEL'S SYSTEM** COAL GAS PLANTS AND GAS APPARATUS. | **P. H. & F. M. ROOTS CO.'S** Exhausters, Governors, etc.

GENERAL AGENTS FOR

**BRONDER'S CHARGING AND DISCHARGING MACHINES.**

# AMERICAN GAS COMPANY,

**222 South Third Street, Philadelphia, Pa.**

# FRED. BREDEL, C.E.

## Coal and Water Gas Plants.

**OWN SYSTEM.**

RECUPERATIVE FURNACES, WASHERS, CONDENSERS, PURIFIERS, PURIFYING MACHINES, COKE CONVEYERS, ETC

SOLE UNITED STATES AGENT FOR

ARROL-FOULIS MECHANICAL CHARGING AND DRAWING MACHINES.

Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas

**GAS RETORTS AND SPECIAL BLOCKS AND FIREBRICK MANUFACTURED UNDER THE SUPERINTENDENCE OF MY OWN CHEMIST.**

COMPLETE GAS WORKS

**No. 118 Farwell Avenue, · Milwaukee, Wis**

Eastern Agents: AMERICAN GAS CO., Construction Department, 222 So. 3d St., Phila., Pa

# ROOTS'

## LATEST IMPROVED GAS EXHAUSTER

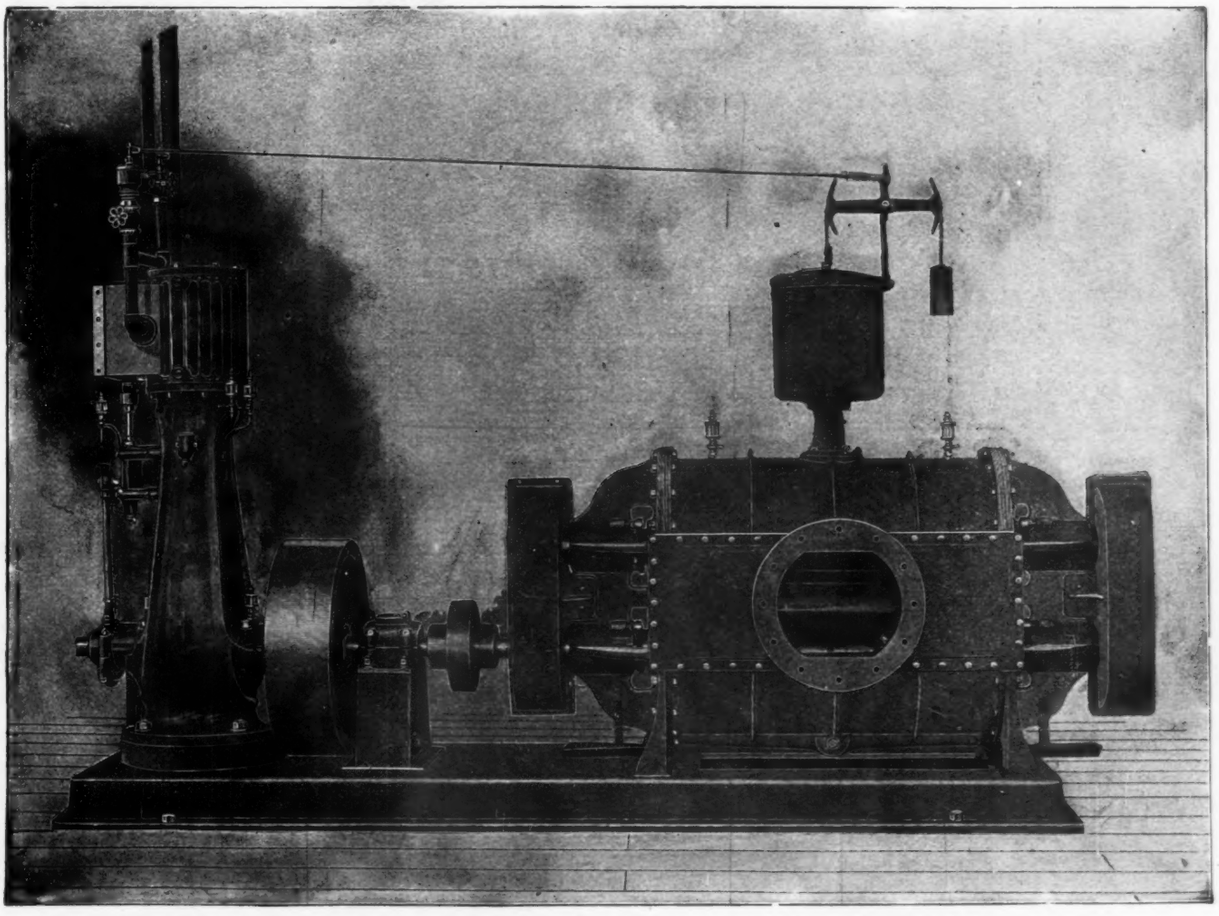
—AND—

## NEW GAS GOVERNOR AND STEAM VALVE.

GUARANTEED TO REGULATE WITHIN ONE-TENTH OF AN INCH, WATER PRESSURE.

## The Most Perfect Gas Governor on the Market.

MORE DIRECT IN ACTION. FEWER PARTS.
EASIER TO ADJUST THAN ANY OTHER GOVERNOR.



INQUIRIES CHEERFULLY ANSWERED. WRITE FOR CATALOGUE.

## P. H. & F. M. ROOTS CO.,

Connersville, Ind. 109 Liberty St., New York.

Eastern Office:

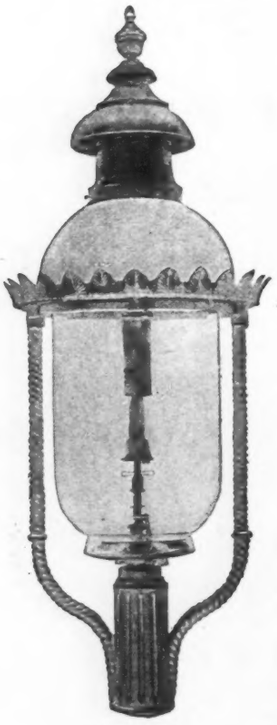
## American Gas Company,

222 South Third Street, Philadelphia, Pa.

NEW YORK, 33 Nassau St. PHILADELPHIA, Broad and Arch Sts. CHICAGO, 54 Lake St.

# Welsbach Street Lighting Company

.... OF AMERICA ....



No. 36.

Controls and Operates the

## Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in seventy-five Cities and Towns.

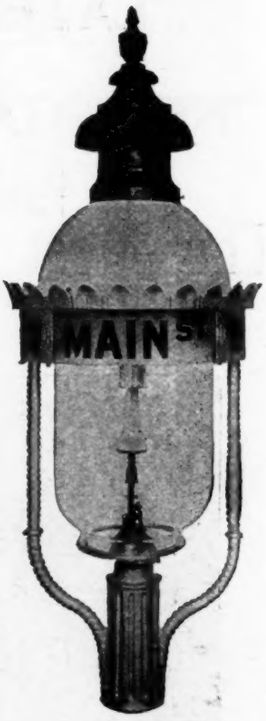
By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

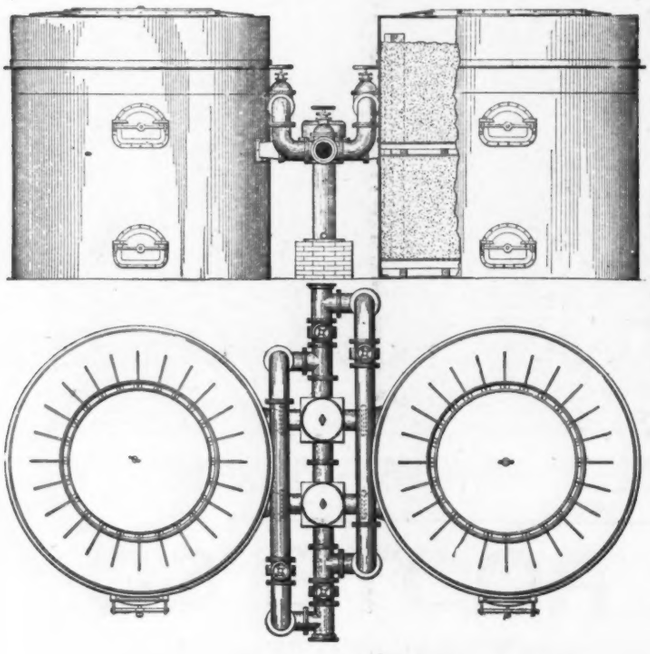
IT LIGHTS THE STREET.

**Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.**




No. 38.

Correspondence solicited from Gas Companies and others interested in Municipal and outside lighting.



## CHOLLAR'S SYSTEM OF GAS PURIFICATION.

Covered by Five U.S. Patents.

In operation, revivification of the oxide is effected by repeated reversals of the direction of the flow of the gas through the beds (in the two boxes used under this system there are eight different routes for the gas to take) whereby the purified gas is made to revive the oxide in parts of the apparatus while the foul gas is fouling it in others.

The boxes are charged or discharged from the sides as well as the top.

There are no Hydraulic Cups or heavy covers.

Either end of the apparatus is inlet or outlet at pleasure.

The capacity is increased five-fold or more over ordinary methods without addition to building.

The apparatus costs less than for any other system.

For Estimates Write **The Stacey Mfg. Co.,**
SOLE MANUFACTURERS,
CINCINNATI, OHIO.

FOR FURTHER INFORMATION WRITE
B. E. CHOLLAR, 411 N. 11th St., St. Louis, Mo.

## Coal Tar Genealogical Tree.

Mr. T. Viner Clarke, of London, Eng., having compiled a novel Chart or Map illustrating the various CHEMICAL PRODUCTS DERIVED FROM COAL AND COAL TAR, in the form of a Genealogical Tree, including all the products discovered (the total number amounting to near 700), offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, $3.50. Orders may be sent to

**A. M. CALLENDER & CO., No. 32 Pine Street, New York**

(Copyrighted, 1894, by the AMERICAN METER CO.

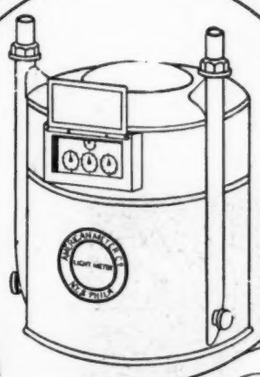
# AMERICAN METER CO.

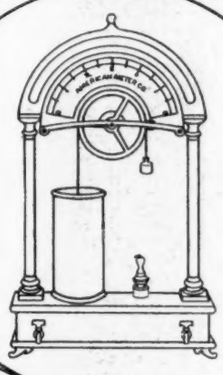
ESTABLISHED 1834. INCORPORATED 1863.

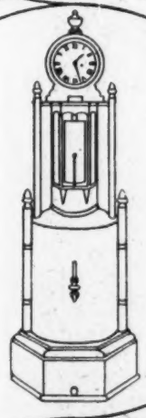
**NEW YORK AND PHILADELPHIA,**

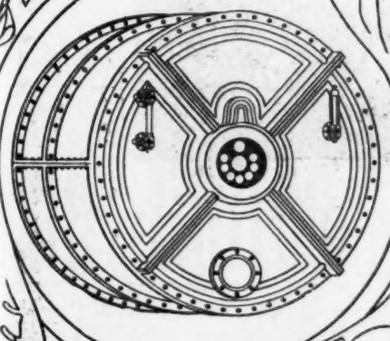
**CHICAGO, ST. LOUIS,**

**SAN FRANCISCO.**





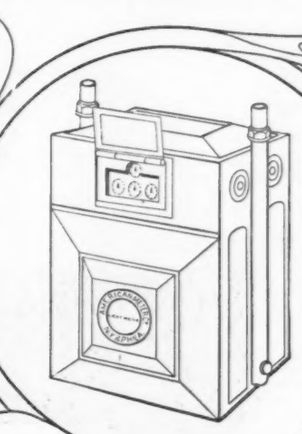


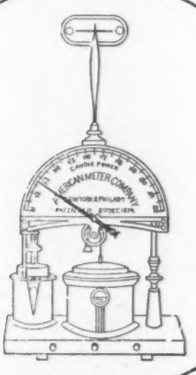


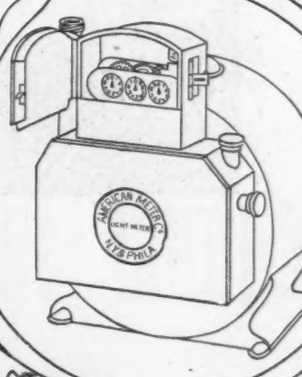
## PUBLIC LIGHTING TABLE.

### APRIL, 1900.

| Day of Week. | Date. | Table No. 1. Following the Moon. Light. | Table No. 1. Following the Moon. Extinguish. | Table No. 2. New York City. All Night Lighting. Light. | Table No. 2. New York City. All Night Lighting. Extinguish. |
|---|---|---|---|---|---|
| | | | | P.M. | A.M. |
| Sun. | 1 | 7.00 PM | 4.40 AM | 6.10 | 4.55 |
| Mon. | 2 | 7.00 | 4.40 | 6.15 | 4.40 |
| Tue. | 3 | 7.00 | 4.40 | 6.15 | 4.40 |
| Wed. | 4 | 11.10 | 4.40 | 6.15 | 4.40 |
| Thu. | 5 | 12.00 | 4.40 | 6.15 | 4.40 |
| Fri. | 6 | 12.40 AM PM | 4.40 | 6.15 | 4.40 |
| Sat. | 7 | 1.10 | 4.40 | 6.15 | 4.40 |
| Sun. | 8 | 1.40 | 4.30 | 6.15 | 4.40 |
| Mon. | 9 | 2.10 | 4.30 | 6.25 | 4.30 |
| Tue. | 10 | 2.30 | 4.30 | 6.25 | 4.30 |
| Wed. | 11 | 3.00 | 4.30 | 6.25 | 4.30 |
| Thu. | 12 | 3.20 | 4.30 | 6.25 | 4.30 |
| Fri. | 13 | No L. | No L. | 6.25 | 4.30 |
| Sat. | 14 | No L. FM | No L. | 6.25 | 4.30 |
| Sun. | 15 | No L. | No L. | 6.25 | 4.30 |
| Mon. | 16 | 7.10 PM | 9.40 PM | 6.30 | 4.20 |
| Tue. | 17 | 7.10 | 10.30 | 6.30 | 4.20 |
| Wed. | 18 | 7.10 | 11.30 | 6.30 | 4.20 |
| Thu. | 19 | 7.10 | 12.20 AM | 6.30 | 4.20 |
| Fri. | 20 | 7.10 | 1.10 | 6.30 | 4.20 |
| Sat. | 21 | 7.10 | 1.50 | 6.30 | 4.20 |
| Sun. | 22 | 7.20 LQ | 2.30 | 6.30 | 4.20 |
| Mon. | 23 | 7.20 | 3.10 | 6.40 | 4.10 |
| Tue. | 24 | 7.20 | 3.40 | 6.40 | 4.10 |
| Wed. | 25 | 7.20 | 4.10 | 6.40 | 4.10 |
| Thu. | 26 | 7.20 | 4.10 | 6.40 | 4.10 |
| Fri. | 27 | 7.20 | 4.10 | 6.40 | 4.10 |
| Sat. | 28 | 7.20 NM | 4.10 | 6.40 | 4.10 |
| Sun. | 29 | 7.20 | 4.00 | 6.40 | 4.10 |
| Mon. | 30 | 7.20 | 4.00 | 6.45 | 4.00 |







### TOTAL HOURS LIGHTING DURING 1900.

| By Table No. 1. | Hrs. Min. | By Table No. 2. | Hrs. Min. |
|---|---|---|---|
| January | 230.50 | January | 423.20 |
| February | 175.40 | February | 355.25 |
| March | 189.00 | March | 355.35 |
| April | 160.30 | April | 298.50 |
| May | 150.40 | May | 264.50 |
| June | 137.00 | June | 234.25 |
| July | 152.00 | July | 243.45 |
| August | 171.50 | August | 280.25 |
| September | 187.20 | September | 321.15 |
| October | 213.10 | October | 374.30 |
| November | 221.50 | November | 401.40 |
| December | 231.50 | December | 433.45 |
| Total, yr. | 2221.40 | Total, yr. | 3987.45 |

"YUSEA"
A new standard of Strength and Light.

Yusea Welsbach Mantle
Saves money.

Yusea Welsbach Mantle
Saves Chimneys.

Yusea Welsbach Mantle
It's faultless.

Yusea Welsbach Mantle
It's Perfect.

Yusea Welsbach Mantle
Fits all burners.

Yusea Welsbach Mantle
Triple Strength

Yusea Welsbach Mantle
A long life.

Yusea Welsbach Mantle
Try it and see.

Yusea Welsbach Mantle
New Standard

Yusea Welsbach Mantle
A revelation.

Yusea Welsbach Mantle
Price 50¢

Yusea Welsbach Mantle
Price 50¢

50 per cent. more light than any other mantle, and three times the strength, insure

"A LONG LIFE AND A BRIGHT ONE."

Sold Everywhere. Price 50 Cents.

"YUSEA" Welsbach MANTLE

BEWARE OF COUNTERFEITS

See that mantle bears our trade mark, "Yusea Welsbach."
Always in box with perforated seal.
Do not accept mantle if seal is broken.

**Welsbach Commercial Co.**

PHILADELPHIA, Pa.

SALESROOMS

PHILADELPHIA, 1530 Chestnut St.
CHICAGO, 67 Washington St.
NEW YORK, 1133 Broadway.
PITTSBURG, 722 Penn Ave.
BUFFALO, 12 E. Eagle St.
DETROIT, 235 Griswold St.
CLEVELAND, 293 Erie St.
ROCHESTER, 28 N. Fitzhugh St.
ST. LOUIS, 1011 Olive St.
SAN FRANCISCO, 138 Ellis St.
DENVER, Toltec Building.
NEW ORLEANS, 213 Baronne St.
WASHINGTON, 439 Seventh St., N W.
BALTIMORE, 203 N. Liberty St.
BOSTON, 22 West St.
CINCINNATI, 415 Main St.

If your dealer cannot supply you, the "Y-use-a" mantle will be sent from any of the above salesrooms, charges prepaid, upon receipt of price.

"Y-USE-A"

# THE UNITED GAS IMPROVEMENT COMPANY.

THE STANDARD JUNIOR,

THE STANDARD DOUBLE SUPERHEATER,

LOWE WATER GAS APPARATUS.

Total Sets Installed to January 1, 1900, - - - - - - - - 327

Total Daily Capacity - - - - - - - - - 207,425,000 Cu. Ft.

WATER GAS PLANT AS AUXILIARY TO COAL GAS WORKS.

## The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY Prest. DAVID R. DALY V. Prest. & Treas.
H. D. ABERNETHY, Sec.

**J. H. Gautier & Co.**

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

E. D. WHITE, President. A. H. GUTKES, Vice-President. H. A. PERKINS, Secretary.

**Brooklyn Fire Brick Works,**

MANUFACTURERS OF

CLAY RETORTS, FIRE BRICK,
Gas House and other Tile.

Office, 88 Van Dyke St. Brooklyn, N. Y.

Established 1854. Incorporated 1869.

**LACLEDE**
**Fire Brick Manufg. Co.,**

Manufacturers of { GAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Exclusive Agents for

The Mitchell Half-Depth Regenerative Furnace.

This is the *original* coal-consuming Furnace for Retort Benches. Burns either Coal or Coke. Full and Half-Depth Regenerative Furnaces for Benches of 6's, 7's, 8's or 9's erected complete.

Proprietors of the Coze System of Inclined Retorts.

Office: 901 Pine St., **St. Louis, Mo.**

**The Construction of Gas Works**

PRACTICALLY DESCRIBED,

By WALTER RALPH HERRING.

Price $2. For Sale by

A. M. CALLENDER & CO.,

32 Pine Street, N. Y. City.

**Adam Weber,**

Proprietor,

Manhattan Fire Brick and Enameled Clay Retort Works.

**Works, Weber, N. J.**

Office, 633 East 15th St., New York.

Modern Recuperative Furnaces

And Standard Fire Brick and Gas Retorts

Works, LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

**JAMES GARDNER, JR.,**

Hamilton Building, Fifth Avenue PITTSBURGH, PA. P. O. Box 373.

Successor to WILLIAM GARDNER & SON

**Fire Clay Goods for Gas Works.**

SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.

**HENRY MAURER & SON,**

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

**RETORT WORKS**

WORKS, Perth Amboy, N. J.

OFFICE, 418 to 422 East 23d St., N. Y.

**Clay Gas Retorts,**

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

**GEROULD'S IMPROVED RETORT CEMENT**

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

*Price List, f.o.b. Galesburg or Mount Vernon.*

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, Galesburg, Ills.

Eastern Agent, GEO. P. WARRINER, 675 Bedford Ave., BROOKLYN, N. Y.

**Parker-Russell Mining and Mfg. Co.,**

CITY OFFICE,
417 Pine Street, St. Louis, Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

**Materials for Gas Companies**

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

Half and Full Depth Benches of Our Own Design,

Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

THEO. J. SMITH, Prest. J. A. TAYLOR, Sec
A. LAMBLA, Vice-Prest. and Supt.

**BALTIMORE RETORT & FIRE BRICK CO.**

MANUFACTORY AT

LOCUST POINT BALTIMORE MD.

**Clay Retorts, Blocks & Tiles**

FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.

Red and Buff Ornamental Tiles and Chimney Tops. Baker Oven Tiles 12x12x2 and 16x16x2.

WALDO BROS., 102 MILK ST., BOSTON, MASS.

Sole Agents for New England States.

**PRACTICAL PHOTOMETRY.**

A Guide to the Study of the Measurement of Light.

By WILLIAM JOSEPH DIBDIN.

With Numerous Illustrations Price, $3.00. A. M. CALLENDER & CO., 32 Pine Street, N. Y. City

# National Gas and Water Company.

CONTRACTORS FOR
**Gas Plant Machinery**

SOFT COAL OR COKE
WATER GAS GENERATORS
A SPECIALTY.

218 LA SALLE ST.,
CHICAGO.

**Gas Engineers**
INSPECTION AND ADVICE.

PLANS AND ESTIMATES
FOR IMPROVEMENTS OR
REPAIRS.

# CONNELLY IRON SPONGE AND GOVERNOR CO.

(Successors to CONNELLY & CO.)
MANUFACTURERS OF GAS WORKS SPECIALTIES.

**"IRON SPONGE."** Saves money, saves labor, and is the most efficient purifying material ever offered as a substitute for lime. We guarantee a large saving, both in cost of material and labor.

**AUTOMATIC GOVERNOR.**
OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT!
WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION!
REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE!
IT IS THE ONLY RECOGNIZED AUTOMATIC GOVERNOR IN THE WORLD!

**STEAM JET EXHAUSTER.** Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

Prices given on all our specialties, delivered at any point in the United States. Correspondence solicited.

**CONNELLY IRON SPONGE AND GOVERNOR CO., No. 357 Canal St., New York.**

## Hughes' "Gas Works,"

**Their Construction and Arrangement,**

**And the Manufacture and Distribution of Coal Gas.**

Originally written by SAM'L HUGHES, C.E.

Rewritten and Much Enlarged by
WM. RICHARDS, C.E

Eighth Edition, Revised, with Notices of Recent Improvements.

**Price, $1.65.**

A. M. CALLENDER & CO.,
32 Pine St., N. Y. City.

## Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

## PARSON'S TAR BURNER,

FOR USING COAL TAR AS FUEL.

## PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for triai*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

H. E. PARSON, Supt., 457 Putnam Ave., Brooklyn, N. Y

## The Chemistry of Illuminating Gas.

By NORTON H. HUMPH Price, $2.40.

A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY.

## The Gas Engineer's Laboratory Handbook.

By JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 32 Pine Street, N.Y City.

## Practical Hints on the Construction and Working of Regenerator Furnaces,

By MAURICE GRAHAM, Assoc M.Inst.C.E.

**Price, $1.25.** For Sale by

A. M. CALLENDER & CO., No. 32 Pine Street, New York City.

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

# THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

## Ocean Mine Youghiogheny Gas Coal,
## Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

## BERWIND-WHITE COAL MINING COMPANY'S

## Ocean Westmoreland Gas Coal.

**Offices:**
Washington Building, New York.
Betz Building, Philadelphia.

**STRICTLY** High Grade. . . . .
Carefully prepared.
For Gas Making or
Heavy Steaming.

# SCIENTIFIC BOOKS.

GAS MANUFACTURE, THE CHEMISTRY OF, by W. J. A. Butterfield. $3.50.
NEWBIGGING'S HANDBOOK. By Thos. Newbigging. 6th edition. $6.
COX'S GAS FLOW COMPUTER. $2.50.
FIELD'S ANALYSIS, 1898. $5.
HUGHES' GAS WORKS. $1.65.
POOLE ON FUELS. By Herman Poole. $3.
GAS ENGINEER'S POCKET-BOOK. By Henry O'Connor. $3.50.
TECHNICAL GAS ANALYSIS. $3.
GAS CONSUMER'S HANDYBOOK, by Wm. Richards. 20 cents.
CHEMISTRY OF ILLUMINATING GAS. By Norton H. Humphrys. $2.40.
PRACTICAL TREATISE ON HEAT By Thomas Box. 2d edition. $5.
PRACTICAL PHOTOMETRY: A Guide to the Study of the Measurement of Light. By W. J. Dibdin. $3.
CHEMICAL TECHNOLOGY: Vol. I., *Fuel and Its Applications*, $5. Vol. II., *Lighting*, $4.
IRONWORK: Practical Designing of Structural Ironwork. By H. Adams. $3.50.
HEMPEL'S GAS ANALYSIS, $2.
LIQUID FUEL FOR MECHANICAL AND INDUSTRIAL PURPOSES. By E. A. Brayley Hodgetts. $2.50.
COAL: Its History and Use. By Prof. Thorpe. $3.50.
PRACTICAL HANDBOOK ON GAS ENGINES, by G. Lieckfield. $1.
HEAT A MODE OF MOTION. By John Tyndall. $2.50.
THEORY OF HEAT. By J. Clerk-Maxwell. $1.50.
MANUAL FOR GAS ENGINEERING STUDENTS. By D. Lee. 40 cents.
GASFITTER'S GUIDE, by John Eldridge 40 cents.
AMMONIA AND AMMONIUM COMPOUNDS. By Dr. R. Arnold. $2
CONSTRUCTION OF GAS WORKS, by Walter Ralph Herring. $2.
DIGEST OF GAS CASES. $5.
PRACTICAL HINTS ON REGENERATOR FURNACES By M. Graham. $1.25.
A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS. By D. A. Graham. $3.
A TEXT BOOK OF INORGANIC CHEMISTRY. By Prof. Victor Von Richter. $2.
ILLUMINATING AND HEATING GAS. By W. Burns. $1.50
HANDBOOK FOR MECHANICAL ENGINEERS. By H. Adams. $2.50.
TREATISE ON MASONRY CONSTRUCTION. Baker. $5
GAS ENGINEER'S LABORATORY HANDBOOK. By Jno. Hornby. $2.50.
GAS LIGHTING AND GAS FITTING. By W. P. Gerhard. 50 cents.
PRACTICAL PLUMBING. By P. J. Davies. $3.
AMERICAN PLUMBING. By Alfred Revill. $2.
CEMENT; A Manual of Lime and Cement, their Treatment and Use in Construction. By A. H. Heath. $2.50.
A COMPARISON BETWEEN THE ENGLISH AND FRENCH METHODS OF ASCERTAINING THE ILLUMINATING POWER OF COAL GAS. $1.60.

**ELECTRICITY.**

INDUSTRIAL PHOTOMETRY, with Special Application to Electric Lighting. By A. Palaz, Sc.D. $4.
ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage and Distribution. By Philip Atkinson. $1.50.
ELECTRIC TRANSMISSION OF ENERGY. By G. Kapp. $3.50.
ELECTRICIAN'S POCKETBOOK. By Monroe and Jamieson. $2.50.
MAGNETISM AND ELECTRICITY. By J. Overend. 40 cts
DYNAMO BUILDING. By F. W. Walker. 50 cents.
DOMESTIC ELECTRICITY FOR AMATEURS. By E. Hospitalier. $2.50.
PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. $1.
PRACTICAL GUIDE TO THE TESTING OF INSULATED WIRES AND CABLES. $1.
ELECTRIC LIGHTING, by Francis B. Crocker. $3.
ELECTRIC LIGHT FITTING. $2.
PRACTICAL ELECTRICITY. $2.50.
ELECTRICITY FOR ENGINEERS. $2.50.
ELECTRICITY, Its Theory, Sources and Applications. By John T. Sprague. $6.

The above will be forwarded upon receipt of price. If sent by mail or express, postage or express charges must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order. No books sent C.O.D.

**A. M. CALLENDER & CO., 32 Pine Street, New York.**

## The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

**DESPARD GAS COAL,**

AND MANUFACTURERS OF

**COKE.**

MINES, - - Clarksburgh, Harrison Co., West Va.
WHARVES, - - - Locust Point Baltimore, Md.
OFFICE, - 640 Equitable Building Baltimore, Md.

ROUSSEL & HICKS, 71 Broadway, N. Y. } AGENTS, { BANGS & HORTON 60 Congress St., Boston.

**KELLER ADJUSTABLE COKE CRUSHER.**

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

## Do You Wish to Know

what size of pipe to use to convey any quantity of gas, any distance, with any loss of pressure and any initial or final pressure? Then use

## Cox's Gas Flow Computer,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 6.5 x 8 inches, in cloth case, $2.50. For sale by

**A. M. Callender & Co., 32 Pine St., N. Y.**

## GREENOUGH'S "DIGEST OF GAS CASES."

**Price, $5.00.**

This is a valuable and important work, a copy of which should be in the possession of every gas company in the country, whether large or small. As a book of reference it will be found invaluable. It is the only work of the kind which has ever been published in this country, and is most complete. Handsomely bound. Orders may be sent to

A. M. CALLENDER & CO., 32 Pine St., N. Y.

— THE —

## PENN GAS COAL CO.

OFFER THEIR

**Coal, Carefully Screened and Prepared for Gas Purposes.**

Their property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad, and on the Youghiogheny River.

Principal Office:

**Room 720, Reading Terminal Building, Phila., Pa.**

**Points of Shipment:**

**Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River: Pier No 1 (Lower Side), South Amboy, N. J.**

EDMUND H. McCULLOUGH, Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

## THE WESTMORELAND COAL CO.

Chartered 1854.

**Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.**

**POINTS OF SHIPMENT:**

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J., WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

**Principal Office, 224 South 3d St., Phila., Pa.**

## THE SUN OIL CO.

Crude Oil, Gas Naphtha,
Refined Petroleum, Gas Oil.

**Toledo, O., and Pittsburgh, Pa.**

## Standard Oil Company,

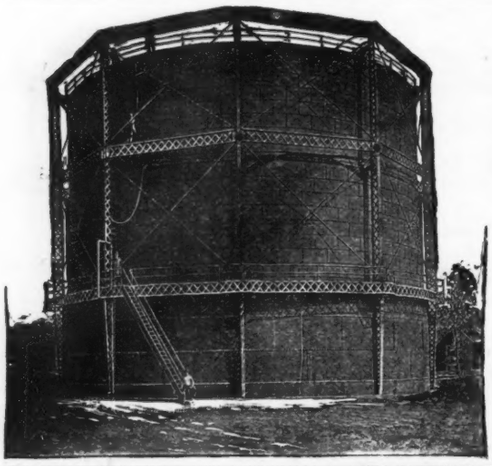
**GAS NAPTHA DEPARTMENT.**

## GAS NAPTHA.

## GAS OIL.

**Correspondence Solicited.**

**26 Broadway, New York City.**



## DAVIS & FARNUM MFG. CO.,
**WALTHAM, MASS.**

Principal Office & Works, Waltham, Mass. Boston Office, R'm 18, Vulcan Bldg., 8 Oliver St.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

Coke Borrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

## BAXTER & YOUNG,
**CONTRACTING AND CONSULTING GAS ENGINEERS.**

Examination and Values Ascertained of Artificial and Natural Gas Properties.

**COMPLETE GAS WORKS ERECTED.**

Artificial and Natural Gas Mains Furnished and Laid.

**CORRESPONDENCE SOLICITED.**

OFFICE : WAYNE COUNTY BANK BUILDING,
Rooms 201 & 202. DETROIT, MICH.

## A. E. BOARDMAN, C. E.,
**Consulting and Contracting Engineer.**

Particular attention given to Gas, Water and Electric Plants. Long and successful experience with the problem and practice of

Filtration for Public Water Supply.

**BREVARD, N. C.**

## JAMES T. LYNN,
**GAS ENGINEER**
AND
**CONTRACTOR,**

Wayne Bank Building, - DETROIT

**GAS PROPERTIES PURCHASED.**

## Geo. Shepard Page's Sons.
**GAS MACHINERY.**

Correspondence Solicited.

**180 Fulton Street, New York City.**

## DAVID LEAVITT HOUGH,
**Consulting Engineer**
AND
**CONTRACTOR,**
374 FIFTH AVE., N. Y

# Kerr Murray Manufacturing Company,

## Steel Gasholder Tanks,

## SINGLE, DOUBLE AND TRIPLE-LIFT GASHOLDERS,

HORIZONTAL AND VERTICAL STORAGE OIL TANKS

Iron Work for Coal Gas Benches, Self-Sealing Mouthpieces, Exhausters, Condensers, Scrubbers, Purifiers, Wooden Trays, Floor Carriages, Center Seal and Valve System Connections, Cast and Wrought Iron Fittings, and Connections 3 to 36 Inches Diameter.

VALVES, Double Gate, Hub and Flange, Outside Screw and Quick Opening, 3 to 36 In. Diam.

**COAL AND COKE WAGONS, RETORT HOUSE TOOLS, STREET MAIN SPECIALS AND DRIPS.**

Address,

## KERR MURRAY MANUFACTURING CO.
**Fort Wayne, Indiana.**

# BARTLETT, HAYWARD & CO.

## BALTIMORE, MD.

## Triple, Double and Single-Lift Gasholders.

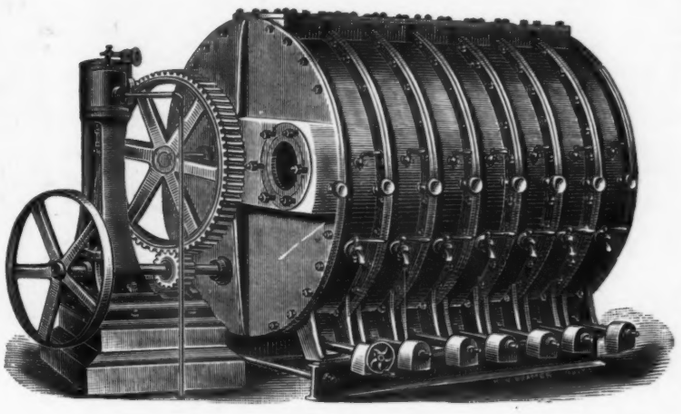
Iron Holder Tanks.

ROOF FRAMES.

Girders.

BEAMS

PURIFIERS.



CONDENSERS.

Scrubbers.

Bench Castings.

OIL STORAGE TANKS

Boilers.

## PATENT STANDARD WASHER-SCRUBBER.

The best apparatus for the extraction of all Ammonia and a large proportion of Carbonic Acid and Sulphureted Hydrogen. The Scrubber has been materially improved and is provided with patented Wooden Segmental Grids, instead of Metallic Discs, thus reducing the weight on shaft and power for operating same

## The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSIBLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

**MILL'S REVERSIBLE LIME TRAYS.**

Gas Works Designed and Constructed.

ALEX. C. HUMPHREYS, M. E., M. nst. C. E. ARTHUR G. GLASGOW, M. E., M. Inst. C. E.

## HUMPHREYS & GLASGOW,

BANK OF COMMERCE BLDG., 31 Nassau Street, New York.

9 VICTORIA STREET London S. W., Eng and.

CONSULTING GAS ENGINEERS AND MANAGERS.

GAS PROPERTIES PURCHASED.

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE

Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,

238 Java Street, Brooklyn, N. Y.

GEORGE R. ROWLAND.

Formerly with the Continental Iron Works.

Draughtsman and Constructing Engineer.

Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.

Office, No. 245 Broadway, N. Y. City.

# R. D. WOOD & CO.,

400 CHESTNUT ST., PHILADELPHIA,

## Producer Gas Power Plants,

—WITH—

## GAS PRODUCERS.

The best Producer for either Bituminous, Anthracite Coal or Lignite. Less labor required and less waste than any other Producer. Patented in the United States and all Foreign Countries. Send for Pamphlet.

**HYDRAULIC TOOLS.** **CAMDEN HIGH PRESSURE VALVES.**

# ISBELL-PORTER CO.,

**ENGINEERS AND CONTRACTORS FOR THE**

## Construction and Extension of Gas Works.

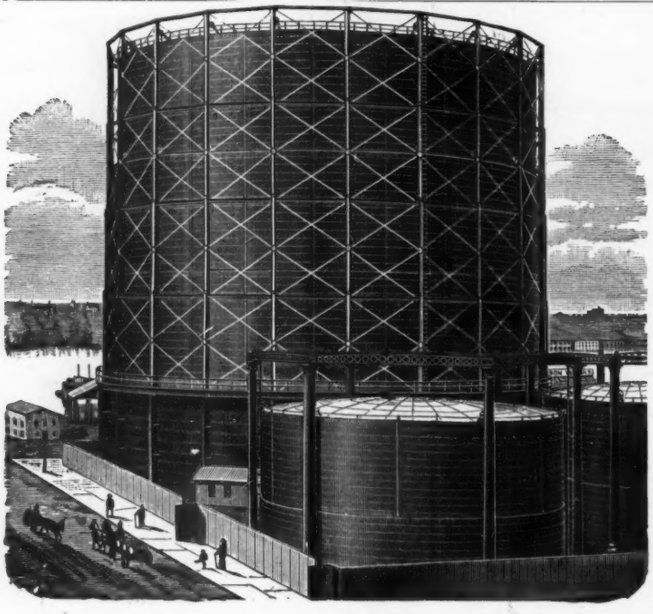
FOUNDERS AND MACHINISTS.

MANUFACTURERS OF

All Ironwork and Machinery Required in a Gas Plant.

Estimates, Drawings and Specifications furnished for the Alteration, Improvement, or Extension of Existing Works or the Construction of New Works.

**245 Broadway, New York City.** —OFFICES— **Bridge & Ogden Sts., Newark, N. J.**



# The Continental Iron Works,

THOMAS F. ROWLAND, President.
WARREN E. HILL and CHAS. H. CORBETT, Vice-Presidents.
THOMAS F. ROWLAND, Jr., Secretary & Treasurer.

**West and Calyer Sts.** (Near 10th & 23d St. Ferries)
NEW YORK, Borough of Brooklyn.

BUILDERS OF

## Gas Holders.

Single and Multiple Section Gas Holders a Specialty.

STEEL GAS HOLDER TANKS.

**BENCH CASTINGS, RETORT LIDS.**

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, Etc.

## Self-Sealing Retort Mouthpieces & Lids

**For Round, Oval, or "D" Retorts.**

ILLUMINATING GAS! FUEL GAS!

## THE LOOMIS PROCESS.

Now in successful operation at Works of John Russell Cuttlery Co., Turner's Falls, Mass., and Henry Disston's Son's Saw Works, Tacony, Pa.

**The Cheapest Gas Generating System in the World.**

Plans and Estimates Furnished.

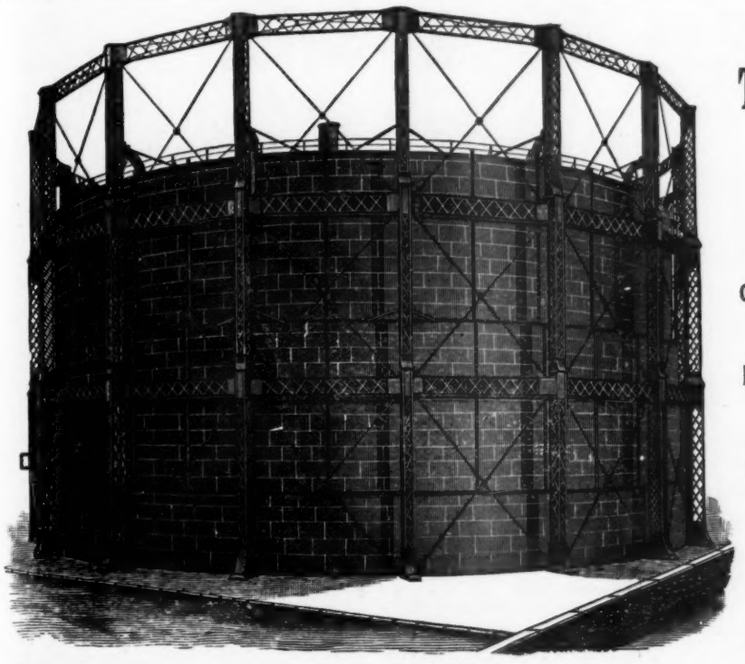
**BURDETT LOOMIS, - - Hartford, Conn.**

**To Gas Companies.**

We make to order **CAP BURNERS** to burn any amount under a stated pressure. Send for samples.

Also SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

**C. A. GEFRORER,**
248 N. 8th St., Phila., Pa.



H. RANSHAW, Prest. & Mangr. T. H. BIRCH, Asst. Mangr.
WILLIAM STACEY, Vice-Prest. R. J. TARVIN, Sec. & Treas.

THE STACEY MANUFACTURING CO.
Established 1851.

Single, Double and Triple-Lift

GASHOLDERS,

Of any Capacity, with or without Wrought Iron or Steel Tanks.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, etc.

Coal Gas Benches, Roof Frames,

OIL STORAGE TANKS.

Pressed Steel Mouthpiece Lids, Self-Sealing Mouthpiece Lids.

Cincinnati, Ohio.

RITER-CONLEY MFG. CO.,

GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers, Oil Tanks, Smoke Stacks.

STEEL ROOFS and BUILDINGS.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

GENERAL OFFICE: Pittsburg, Pa. EASTERN OFFICE: 39-41 Cortlandt St., New York City.

WM. HENRY WHITE,

No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

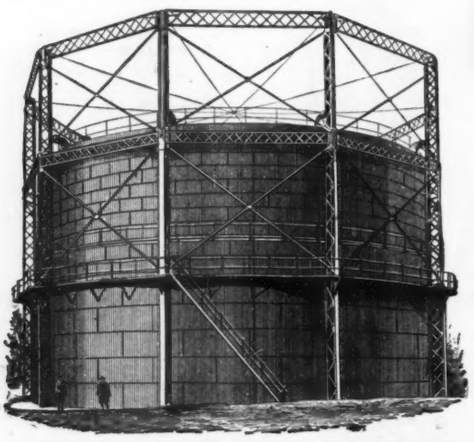
Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited.
Plans and Estimates Furnished.

1899 DIRECTORY 1899

OF AMERICAN GAS COMPANIES

Price - - - - - - - - $5.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.



# 1842 ※ Deily & Fowler, ※ 1900

## LAUREL IRON WORKS.

Office, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

## Gasholders

Single or Telescopic. With or Without Iron or Steel Tanks.

OIL TANKS, WATER TANKS, AND GENERAL WROUGHT IRON WORK.

---

# James R. Floyd's Sons,

FREDERICK W. FLOYD, President.
HENRY E. FLOYD, Vice-President.
JAMES R. FLOYD, Jr., Sec'y & Treas.

531 to 543 West 20th Street and 530 to 540 West 21st Street, N. Y.

## Engineers and Contractors for the Construction of Gas Works.

MANUFACTURERS OF

**All Kinds of Castings and Iron Work for Gas Apparatus.**

ESTABLISHED 1856.
INCORPORATED 1899.

Write for Estimates to
539, West 20th St., New York City.

---

# LOGAN IRON WORKS,

## Brooklyn, N. Y.

BUILDERS OF

## GASHOLDERS

Oil Tanks, Water Tanks, and General Wrought Iron Work.

**1899** brought to us the **Largest Number of Gasholder Contracts** of any year in our history. Work was erected abroad as well as in many States of the Union, covering points separated by thousands of miles.

PLANS AND SPECIFICATIONS FURNISHED AND CORRESPONDENCE SOLICITED.

## BINDER for the JOURNAL.

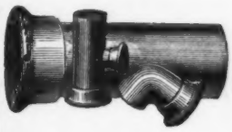
Price $1.00.

A. M. CALLENDER & CO., 32 Pine Street, N.Y.

## WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.



CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

—THE—

## Valuation of Gas, Electricity and Water Works

FOR ASSESSMENT PURPOSES.

SECOND EDITION.

By THOS. NEWBIGGING, M.Inst.C.E., and WM. NEWBIGGING, Assoc.M.Inst.C.E.

With an Appendix of Decided Cases.

Price $2. For Sale by

A. M. CALLENDER & CO., 32 Pine Street, N. Y. City.

"GLOBE" SPECIALS, VALVES, ETC. "CLAMORGAN" FIRE HYDRANTS

## M. J. DRUMMOND & CO.

MANUFACTURERS OF

CAST IRON FLANGE GAS and WATER PIPE

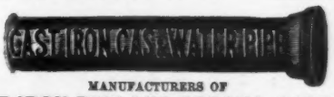
GENERAL SALES OFFICE, 192 BROADWAY, NEW YORK.

Western Office: Monadnock Block, Chicago, Ills.

GEORGE ORMROD, Manag. & Treas., Emaus, Pa.
JOHN DONALDSON, Prest., Betz Bldg., Phila., P.

## EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.




MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

## POOLE ON FUELS.

THE CALORIFIC POWER OF FUELS.

By HERMAN POOLE, F.C.S.

Price, $3. For Sale by

A. M. CALLENDER & CO., 32 PINE ST., N.Y. CITY.

## The Gas Engineer's Laboratory Handbook.

BY JOHN HORNBY, F.I.C. Price, $2.50.

A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY.

Established 1854.

# D. McDONALD & CO.,

MANUFACTURERS OF

WET AND DRY METERS, STATION METERS AND METER PROVERS.

ALSO MAKERS OF

# THE GLOVER PREPAYMENT METER.

The amount of gas delivered for the coin can be instantly and positively changed without removing the meter or replacing any parts.

The gas registered agrees absolutely with the amount purchased by the coin.

WE HAVE MADE AND SOLD IN THE UNITED STATES

## OVER 50,000 OF THESE METERS,

ALL OF WHICH ARE GIVING PERFECT SATISFACTION.

Correspondence Solicited.

511 West Twenty-first Street, NEW YORK. | 51, 53 & 55 Lancaster Street, ALBANY, N. Y. | 34 & 36 West Monroe Street, CHICAGO.

**Established 1849.** With the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

# NATHANIEL TUFTS METER CO.,

*8 Medford Street, Boston, Mass.*

MANUFACTURERS OF

## DRY GAS METERS.

Station Meters of any Capacity.

**Test and Experimental Meters, Pressure Registers, Pressure Gauges.**

**METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.**

**Prepayment Gas Meters.**

---

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

# THE MARYLAND METER AND MANUFACTURING CO.

Established 1866.

**BALTIMORE, North & Saratoga Sts.** **CHICAGO, 107 West Monroe St.**

**SAN FRANCISCO, 221 Front St.**

**CONSUMERS' & STATION METERS, PRESSURE GAUGES, Etc., Etc.**

**"Perfect" Gas Stoves**

---

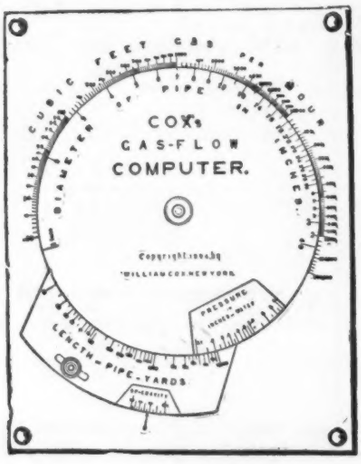
**A PERFECTLY ACCURATE METER**
**AN ALWAYS-TO-BE-DEPENDED-ON METER**
**A BEST-MADE METER**
**A SURE-TO-PLEASE METER**

# THE KEYSTONE METER

**Made at ROYERSFORD, PA.**

Pacfiic Coast Supplied by WIESTER & CO., 17 & 19 New Montgomery St., San Francisco, Cal.

---




# Do you wish to Know

what size of Pipe to use to convey any quantity of Gas, any distance, with any loss of pressure, and any initial or final pressure? Then use

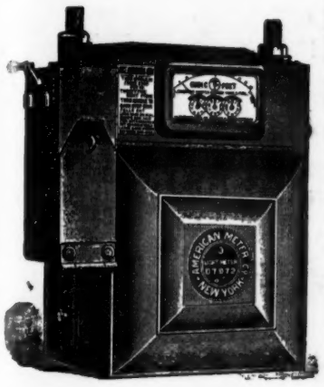
## COX'S GAS FLOW COMPUTER,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

**Price, 6.5 x 8 inches, in cloth case, $2.50.**

For sale by

**A. M. CALLENDER & CO., 32 Pine St., N. Y. City.**



# American Meter Co.

NEW YORK, PHILADELPHIA,
SAN FRANCISCO.

## Prepayment Meters.

**Their construction is such that they may be readily readjusted when the scale of gas rates is changed.**

# HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

MANUFACTURERS OF

## Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

**METERS REPAIRED**

## PREPAYMENT GAS METERS.

**Our Own Patents. Strong. Simple.** PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

# METRIC METAL COMPANY,

MAKERS OF

## GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

**FACTORY AT ERIE, PA.**

## EXCERPTS FROM DECISIONS

—OF THE—

## BOARD OF GAS COMMISSIONERS of the COMMONWEALTH OF MASSACHUSETTS.

MR. E. H. YORKE, NEW HAVEN, CONN., Dec. 1, 1898.

Dear Sir:—I am in receipt of a copy of "Excerpts from the Decisions of the Board of Gas Commissioners," which is a handy compilation in book form of extracts from the most recent decisions of the Gas Commission of Massachusetts.

I note that most of these extracts are broad and safe-guiding precepts, which apply with equal force to one Company as to another. The 13 years' existence of the Board of Gas Commissioners with its unusual opportunities for acquiring information, have justly made it a high and safe authority in all matters pertaining to the management, obligations, and rights of Gas Companies. Your little book will serve as valuable reference library in settling legal complications which often arise between a Gas Company and its customers.

Yours truly, (Signed) F. C. SHERMAN, Superintendent.

A 28-page Pamphlet containing the cream of this Board's decisions as to the proper management of Gas Companies.

**Compiled by E. H. YORKE. Price $1.00. Address**

**A. M. CALLENDER & CO., - No. 32 Pine Street, N. Y. City.**

The advertisement of

THE WESTERN GAS CONSTRUCTION COMPANY, Engineers and Builders,

Improved Double Superheater Lowe Water Gas Apparatus—Manufacturers of General Gas Works Machinery—Builders of Gas Works

WM. HENRY WHITE, Eastern Engineer, 32 Pine St., New York.

FORT WAYNE, IND.,

Occupies this space every alternate week

# JOHN J. GRIFFIN & CO.,

**1513-1515-1517-1519-1521 Race Street, Philadelphia.**

**52 Dey Street, New York.**
WM. S. GRIBBEL, Manager.

**75 N. Clinton St., Chicago.**
FREDERICK WAUGH, Manager.

MANUFACTURERS OF

## STATION METERS, CONSUMERS' METERS,

Provers, Registers, Gauges, Experimental Apparatus, Etc.

Prompt Attention Given to All Repairing.

## OUR SPECIAL NATURAL GAS METER

**Is the Best ever offered. Over 30,000 now in use.**

We manufacture in the United States, under the SAWER & PURVES PATENTS, the

# Positive Prepayment Meter.

. . SIMPLE . .

. DURABLE .

. ACCURATE .

. RELIABLE .

All Parts Interchangeable

This Meter is an unqualified success in Great Britain. Its simplicity of construction, and the positive character of the service performed by it, have given it pre-eminence.

**Needs Only the Care Given an Ordinary Meter.**
**Saves MONEY, TIME and CONSUMERS.**
**Dispenses with "DEPOSITS" and Increases OUTPUT.**